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Tobacco Control in the European Union

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SUMMARY

Background

Smoking is the leading avoidable cause of mortality and serious disability worldwide. The prevalence of smoking varies greatly between the 27 European Union (EU) Member States as does the implementation of tobacco control policies. The main aims of this thesis were to investigate the extent of the variation between and the reliability of measures of smoking prevalence, the relation between prevalence and tobacco control policy implementation, the country characteristics associated with policy implementation, and a detailed analysis of the association between cigarette prices and smoking prevalence.

Methods

The validity of measurements of adult smoking prevalence across the EU was investigated by comparing estimates obtained from the region-wide Eurobarometer survey with individual national prevalence studies. Trends in the Eurobarometer over time for individual countries were also assessed where feasible. Estimates of youth smoking prevalence and trends over time in EU Member States were also compared between the European School Survey Project on Alcohol and Other Drugs (ESPAD), and the Health Behaviour in School-aged Children survey (HBSC). Associations between smoking prevalence and an objective measure of tobacco control policy implementation, the Tobacco Control Scale, were also explored and related to national characteristics including economic development, quality of life, social inclusion, and public sector corruption. The effect of corruption on tobacco control implementation and enforcement was explored in detail, using smoke-free policy as an example of a currently topical tobacco control intervention. To investigate differences and

trends in cigarette affordability across the EU three affordability measures (Minutes of Labour, Relative Income Price, and the Big Mac index) were compared for two different price indicators (Most Popular Price Category (MPPC), and *Marlboro* prices) and the MPPC/Minutes of Labour measure used to describe differences, trends, and associations with smoking prevalence in EU Member States.

Results

On average in 2006, the Eurobarometer prevalence estimates were higher than those from national surveys by 0.37 percentage points. However, the absolute difference varied markedly, the national estimate being 13 percentage points higher in Slovakia and 10 percentage points lower in the UK. Most national surveys used considerably larger sample sizes than the Eurobarometer survey, but variation in questions used to detect smoking status produced national estimates that were not directly comparable between countries. Results suggest a decrease in average prevalence of smoking of manufactured cigarettes between 2002 and 2006 from 31.2 per cent to 27.4 per cent, however the number of countries involved differed between surveys. Although no indication for a decrease in average overall smoking prevalence was found, when trends in individual countries were investigated a decrease in Poland and an increase in Bulgaria was found. Using ESPAD survey data for 15 year olds, on average a decrease of 3.3 percentage points among boys was observed between 1995 and 2007 ranging from an 18 percentage point decrease in Ireland to a 9 percentage point increase in Slovenia. Among girls on average an increase of 0.7 percentage points was observed during the same period ranging from an 18 percentage point decrease in Ireland to an 18 percentage point increase in Slovakia. Among 15 year-olds in the HBSC survey the average decrease in smoking prevalence

among boys between 1993 and 2005 was three percentage points, ranging from a 12 percentage point decrease in Belgium to an 11 percentage point increase in Lithuania. Among girls, average smoking prevalence did not change but within-country changes ranged from an 11 percentage point decrease in Sweden to a 14 percentage point increase in Lithuania. A significantly decreasing trend for boys in Belgium was found in the HBSC survey over time but not in any of the other countries. However, there was an indication for increasing trends in smoking prevalence in Estonia, Latvia and Lithuania.

Smoking prevalence was higher in EU countries with higher levels of public sector corruption, material deprivation, and gender inequality; and lower in countries with higher *per capita* Gross Domestic Product, social spending, life satisfaction and human development scores. In a multivariate analysis, only corruption (measured as the *Transparency International* Corruption Perceptions Index) was independently related to smoking prevalence. Corruption was also correlated with exposure to tobacco smoke in the workplace, independently from smoking prevalence, but not with national smoke-free policy implementation, suggesting that although smoke-free policies were implemented in countries with higher levels of corruption, these policies were not being adequately enforced.

Cigarette affordability for the MPPC/Minutes of labour measure ranged fourfold across the EU, the mean (SD) number of minutes of labour required to purchase 20 MPPC cigarettes in 2009 being 31.3 (10.7), but tended to be significantly higher in new Member States. The number of minutes of labour measure increased more, though not significantly so, between 2003 and 2009 in new (mean (SD) 12.1 (10.9)) than in old (6.7 (4.0)) Member States, largely because of proportionately higher increases in taxation. However there was no correlation between changes in affordability and changes in smoking prevalence in recent years in these countries.

Conclusions

There is a marked variation across the EU in both youth and adult smoking prevalence, but adult measures based on the Eurobarometer survey are of questionable validity as they differ markedly from those obtained in larger national surveys. There is a clear need for larger scale standardised prevalence surveys across the EU.

Smoking prevalence tends to be higher, and adherence to (but not implementation of) tobacco control policies lower in more corrupt countries, indicating that strong and transparent leadership is essential for ensuring that effective tobacco control policies are implemented across the EU.

Cigarette prices and affordability vary markedly between EU Member States, indicating that there may be benefit in harmonising affordability through tax measures. However, although cigarettes were generally becoming less affordable in EU countries there was no relation between changes in smoking prevalence and affordability over the short term, suggesting that the potential for price to reduce consumption is not currently being harnessed.

OUTLINE OF THE THESIS

The thesis consists of eight chapters. Chapter 1 summarizes the general background of the research topic, including a description of the burden caused by the tobacco use and effectiveness of main tobacco control policies.

Chapter 2 provides a general description of the European Union, decision making and tobacco control legislation in the European Union. At the end of Chapter 2 the justification for the thesis along with aims and objectives is presented.

Chapter 3 investigates the reliability of adult smoking prevalence estimates comparing methods used and results obtained from national surveys in 27 European Union Member States and the Eurobarometer survey which measures prevalence across all these countries.

Chapter 4 of the thesis includes analysis of reliability of smoking prevalence estimates in young people comparing estimates from two international surveys- the Health Behaviour in School-aged Children survey and the European School Survey Project on Alcohol and other Drugs.

In Chapter 5 the association between implementation of tobacco control policies and smoking prevalence has been investigated along with the association between various national characteristics, including perceived corruption, smoking prevalence, and implementation and enforcement of tobacco control policies.

In Chapter 6 cigarette price and affordability, and variation in these two variables across the European Union has been explored, and the best measure for investigating cigarette affordability has been identified. In Chapter 7 affordability of cigarettes has been further investigated, exploring changes over time and association between cigarette affordability, taxation and smoking prevalence.

In the final chapter findings from the research presented have been summarized and research gaps and further steps have been identified.

Publications arising from this thesis

Bogdanovica I, Godfrey F, McNeill A, Britton J. Smoking prevalence in the European Union: a comparison of national and transnational prevalence survey methods and results. *Tob Control*. 2011 Jan;20(1):e4. Epub 2010 Oct 21.

Bogdanovica I, McNeill A, Murray R, Britton J. What Factors Influence Smoking Prevalence and Smoke Free Policy Enactment across the European Union Member States. *PLoS One*. 2011;6(8):e23889. Epub 2011 Aug 31.

Bogdanovica I, Murray R, McNeill A, Britton J. Cigarette price, affordability and smoking prevalence in the European Union. *Addiction*. 2012 Jan;107(1):188-96. doi: 10.1111/j.1360-0443.2011.03588.x. Epub 2011 Nov 1.

Bogdanovica I, Murray R, McNeill A, Britton J. Measuring Cigarette Prices and Affordability in the European Union. *Under review*.

Conference presentations

15th World Conference on Tobacco or Health (WCTOH), March 20-24, 2012

- Poster presentation: Cigarette prices and affordability in the European Union

XIIIth Annual Meeting of Society for Research on Nicotine and Tobacco September 8-11, 2011

- Poster presentation: Changes in cigarette affordability, taxation and prevalence in the European Union

5th European Conference on Tobacco or Health March 28-30, 2011

- Oral presentation: "Smoking prevalence and smoke-free policy implementation and national characteristics of European Union countries"
- Poster presentation: "Cigarette prices and affordability in the European Union"

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ABBREVIATIONS

AT- Austria

BE- Belgium

BG- Bulgaria

CPI- Corruption Perceptions Index

CY- Cyprus

CZ- Czech Republic

DE- Germany

DK- Denmark

EB- Eurobarometer

EC- European Commission

EE- Estonia

EIU- Economist Intelligence Unit

EL- Greece

ES- Spain

ESPAD- European School Survey Project on Alcohol and Other Drugs

EU- European Union

EUR- Euro

FCTC- Framework Convention on Tobacco Control

FI- Finland

FR- France

HBSC- Health Behaviour in School-aged Children

HU- Hungary

IE- Ireland

IT- Italy

LT- Lithuania

LU- Luxembourg

LV- Latvia

MoL- Minutes of Labour

MPPC- Most popular price category

MT- Malta

NL- Netherlands

PL- Poland

PT- Portugal

RIP- Relative income price

RO- Romania

SD- Standard deviation

SE- Sweden

SI- Slovenia

SK- Slovakia

TCS- Tobacco Control Scale

UBS- Union Bank of Switzerland

UK- United Kingdom

US- United States

USD- US dollars

WHO- World Health Organization

Chapter 1: Introduction

1.1 Burden of smoking

Smoking is the leading global cause of death and serious disability killing around 5 million people worldwide, mostly from developing countries, every year[1,2]. In 2005, 27.2% of male and 10.5% of female deaths worldwide could be attributed to smoking[3]. Mortality projections suggest that in the year 2020 there will be between 7.4 and 9.7 million tobacco attributable deaths worldwide, with mortality declining in industrialised countries and likely to be doubling in developing countries[4].

Between 1960 and 2000 in the 25 EU Member States (i.e. before accession of Romania and Bulgaria in 2007) about 24 million people aged 35-69 years died from smoking[5]. Smoking is related to increases in all-cause mortality, cancer mortality, especially lung cancer, and mortality from chronic obstructive pulmonary disease (COPD) and cardiovascular diseases[6,7]. It is estimated that in the EU annually about 650 thousand people are killed by smoking, particularly through lung cancer, cardiovascular diseases, and COPD. In middle aged men one in three deaths is due to smoking[8]. In general, smoking causes about three times more deaths than all non- medical causes put together, and also accounts for about 25% of cancer deaths[8].

On average, smokers die 10 years younger than non- smokers[9]. A longer duration of smoking and higher number of cigarettes smoked is related to increased risk of overall mortality[10]. Depending on age at quitting, smokers can gain up to 10 years of life expectancy by quitting smoking[9]. The health risks of smoking are substantial even for occasional smokers[11,12]. Passive, or second hand smoking also causes a considerable burden to health causing more than 79 thousand deaths in the EU countries every year[13,14].

1.2 Brief history of tobacco use

There are historical documents confirming that ancient civilizations in Egypt, Persia and China used to smoke. Smoking was brought to various parts of America, and the tobacco plant is known to have been grown in Mayan civilization. Tobacco was used for other purposes, not merely smoking, and was believed to have a divine origin. In North American tribes where tobacco use was a privilege of priests and medicine men it was also believed to cure respiratory diseases[15]. In ancient times, tobacco was most commonly used as snuff, but it was also eaten, chewed, drunk and applied to the body. Tobacco was used medically for its analgesic and antiseptic properties[16,17].

Tobacco was brought to Europe by Christopher Columbus in 1492 and later by the Portuguese explorer Pedro Alvarez Cabral in 1500. Tobacco was first brought to England by Royal Navy captain Sir John Dawkins in 1564 and later in 1586 by Sir Walter Raleigh from his first trip to Virginia[15,16]. In the times of Elizabeth I smoking was taken up by affluent English society and the Queen herself. However, King James I of England was strictly against tobacco use[16].

Smoking pipes became popular in the last quarter of the 16th century. In the 17th century pipe smoking spread to the Netherlands, and in the following two centuries throughout Europe. Over the years the manner of tobacco use changed from pipe smoking to snuff in the 17th century and cigars in the 18th century[18]. Manufactured cigarettes were first available in England in the 1850s and later became the most widely used way of delivering nicotine[16]. Cigarettes became very popular among British soldiers in World War I and by the end of World War II had almost completely replaced other tobacco products. Smoking primarily was popular among men, however at the end of the 19th century women took up smoking in New Zealand, and later in the US and Britain[18].

With the growing popularity of smoking, adverse health effects began to be noticed. The German physician, H.Rottmann, was the first who linked tobacco with lung cancer in the 1890s by noticing that women working in tobacco factories were more prone to getting the disease[17]. More research became available in 1930s and 1940s where lung cancer was investigated in relation to smoking status[17].

By the beginning of the 20th century community groups that discouraged people from smoking due to the addictive nature of nicotine began to emerge. This was the beginning of the anti-tobacco movement and these groups were successful in the US but had little influence in the UK. A similar association was formed in Germany in the beginning of the 20th century; however their ideas became popular in 1930, when Hitler came to power strongly opposing tobacco use[18].

Evidence on the harm caused by tobacco use has been available for decades[7], and the principles of prevention, broadly referred to as tobacco control, established for decades. However many governments have been reluctant to act to implement effective policies. Variation in the development of tobacco control is also a reason for the differences in the progression of smoking epidemic across different countries[19].

1.3 Smoking prevalence

Currently there are more than one billion smokers around the world [20] and it is predicted that this number will grow, reaching 1.7 billion in 2025[21].

In 2007, Western Europe accounted for 9% of global tobacco consumption[22]. In 2009 the European Union overall smoking prevalence (cigarettes, cigars and pipes) was 29%, and 79% of smokers use manufactured cigarettes every day[23,24]. However, smoking prevalence estimates vary across EU countries being

the highest in Southern European countries (Greece, Bulgaria) and lowest in the Nordic countries (Sweden), and in 2009 was in the range from 16% in Sweden to 42% in Greece[23].

1.3.1 Smoking prevalence and gender

In the beginning of the 21st century there were about 250 million daily smoking women and 1 billion daily smoking men[25]. Worldwide in 2006, 41.1% of males and 8.9% of females aged 15 and over were current smokers and 17.5% of male and 10.4% of female adolescents (13-15 years) were smokers[26].

Overall, smoking is more common among males, but globally a slow decline in the prevalence of smoking among males has been observed. However, despite lower current smoking prevalence rates among females, an increase in the future is predicted[1], and it is estimated that in 2025 smoking prevalence among females will be 20% or 532 million smokers[27].

Lopez et.al have developed a model explaining the smoking epidemic in stages characterized by changes in male and female smoking patterns (see Figure 1.1.).

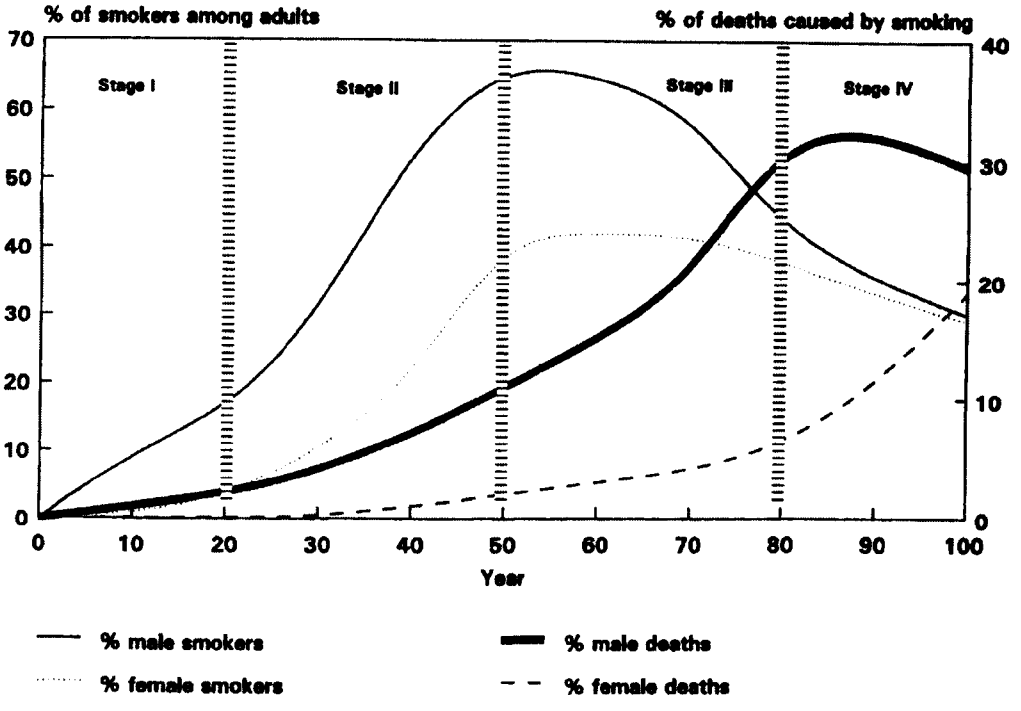

Figure 1.1: A model of cigarette epidemic in industrialised countries (adapted from Lopez et al.)[19]

At the beginning of the smoking epidemic there is a relatively low smoking prevalence among males and females but higher among males (typically below 15%). This initial stage typically lasts for one or two decades. The second stage might last for two to three decades and generally is characterized by a rapid increase in smoking prevalence in males. Smoking prevalence in women is usually lower than in males and typically lags behind smoking prevalence in men by one or two decades. In the third stage male prevalence begins to decline and by the end of this stage might have reduced by about 20 percentage points for example declining from 60% to 40%. Towards the end of the third stage women's smoking prevalence starts to plateau but tends to remain at the same level for long time. In the fourth stage smoking prevalence gradually declines in both males and females[19]. Some EU countries, such as the UK, have experienced large decreases in smoking in recent years, while other countries still have very high smoking prevalences and nearly half of their population is smoking (Greece,

Bulgaria). Current EU Member States are thus at very different stages of the smoking epidemic.

1.3.2 Smoking prevalence and age

The majority of smokers take up smoking in adolescence[28]. In many industrialized countries smoking prevalence in younger age groups is higher than among other age groups. For example, in Portugal an increase in smoking prevalence was observed from age 10, reaching a peak in the 35-44 year-old age group, and then declining gradually in older age[29]. Similarly, in Britain since the 1990s smoking prevalence has been the highest among those aged 20 to 24 years[30].

Evidence on the consistency of smoking prevalence measures obtained from various data sources is limited. A study in the US had found that there were considerable differences between smoking prevalence estimates obtained from the National Health Interview Survey and the National Survey on Drug Use and Health[31]. Another study in the US investigating systematic differences between the Behavioural Risk Factor Surveillance System and the Current Population Survey concluded that estimates from both surveys are comparable and provide similar prevalence estimates[32]. In the EU there are no previous studies investigating whether discrepancies exist between prevalence estimates from various surveys and the reliability of prevalence figures reported in various sources has not been assessed for adolescents or adults.

1.4 Smoking and health

It has been known for more than a century that smoking has severe adverse effects on health[33]. It is estimated that in 2030 10 million deaths worldwide will be associated with tobacco use[34]. Smoking is the most common cause of respiratory diseases, contributes to the development of cardiovascular diseases and is an important determinant of development of other diseases including several types of cancer[5].

1.4.1 Respiratory diseases

The main threat caused by smoking to the respiratory system is damaging cells in the airways which may result in uncontrolled cell growth and lead to lung or laryngeal cancer[35]. Studies from the 1950s showed that smoking significantly increases risk of lung cancer[6] and men who smoke are 23 times and women 13 times more likely to develop lung cancer compared to non-smokers. Smoking causes around 90% of all lung cancer deaths in males and 80% in females[36].

Cigarette smoking is a leading cause of COPD[37] and 90% of COPD related deaths are caused by smoking[36]. Smoking is also related to a significantly increased risk of pneumonia in smokers compared to non-smokers by 1.9 to 2.3 times in men and 2.0 to 4.6 times in women[38]. Smoking increases the risk of asthma exacerbation and children exposed to environmental tobacco smoke are at an increased risk of developing asthma[39].

1.4.2 Cardiovascular diseases

Smoking is one of the most important factors contributing to the development of cardiovascular disease, acting synergistically with other factors such as diet[5].

Smoking increases the risk of developing coronary heart disease and stroke by approximately two to four times[36].

Cigarette smoking also contributes to the development of peripheral vascular disease, including abdominal aortic aneurysm[36,40]. Health risks associated with smoking are generally related to the quantity smoked, though the dose-response relationship is not linear, for example for cardiovascular disease light smoking is related to about 70% of the risk caused by heavy smoking[41].

1.4.3 Cancer

Apart from lung cancer mentioned above, smoking contributes to the development of various other types of cancer[37] including lung and upper respiratory cancers, oral cavity cancer, oesophageal cancer, bladder cancer, kidney cancer, stomach cancer, pancreatic cancer, myeloid leukaemia, cancer of the cervix and uterus, and others[5,38].

Being a current smoker doubles the risk of dying from cancers. For some cancers like lung cancer, there is a clear dose-response relationship suggesting that the risk of developing various types of cancer increases along with an increase in daily cigarette consumption or duration of smoking[5,42].

1.4.4 Other diseases

Smoking also increases the risk of infertility, preterm delivery, stillbirth, low birth weight and sudden infant death syndrome[36]. Smoking is also associated with a range of non-fatal diseases such as gastrointestinal diseases including peptic ulcer, skin disease, eye disease, hip fracture, type II diabetes and others[38].

1.4.5 Health effects of passive smoking

Considerable burdens to health are caused by exposure to environmental tobacco smoke or passive smoking[43]. In adults passive smoking increases the risk of lung cancer by 20-30% and of heart disease by 25-35%. Passive smoking also leads to the development of more severe symptoms of asthma, exacerbation of bronchitis, shortness of breath, airway irritation, coughing, nausea, headache and eye irritation[44]. Fetal exposure to tobacco smoke during pregnancy through the mother's smoking has a number of impacts including a higher risk of giving birth prematurely and having babies with low birth weight[45]. Non-smoking women who are exposed to passive smoking during pregnancy are also more likely to experience stillbirth and deliver a child with congenital malformations[46,47].

In children, exposure to environmental tobacco smoke increases the risk of sudden infant death, lower respiratory tract infections, middle-ear disease, and asthma[46].

1.5 Costs of smoking

It has been argued that from a government perspective a reduction in smoking prevalence might lead to a decrease in income due to lower levels of tax revenue from tobacco products and increased unemployment in countries where tobacco growing and production is a crucial part of economies[48]. However, tobacco control policy interventions are proven to be cost effective as in the long run they reduce costs occurring due to the extensive morbidity and premature mortality. The World Bank has stated that a reduction in tobacco consumption might, in some countries, result even in job gains as instead of buying tobacco, other goods will be consumed thus generating new jobs[49].

Smoking imposes a large economic burden on society through direct and indirect health care costs and costs in other sectors of economy. Direct costs include all costs related to inpatient and outpatient care[50] while indirect costs capture mortality, early retirement, and absenteeism from work. Even though non-smokers tend to live longer, lifetime health costs are much lower compared to smokers. Being an ever smoker both for males and females is related to higher annual direct and indirect costs which are on average 1.6-1.8 times higher compared to non- smokers[51]. Quitting smoking is an effective way of reducing life-time costs of smoking as quitting at the age of 35 will result in approximately 30-40% health costs saving for men and women[52].

In the EU and European Free Trade Association countries overall, annual smoking costs are estimated at around 97.7 billion Euros, about half of which are direct costs of 49.83 billion corresponding to 211 to 281 Euros per capita per annum (year 2000 data)[50].

1.6 Health inequalities and smoking

In developed countries smoking prevalence generally tends to be higher in deprived populations, and the odds of being a current smoker among the most deprived groups (characterized by minimal level of education, manual occupations and low income) is three times those for the most affluent group[53,54]. Level of education is also an important predictor of smoking prevalence[55,56], lower education being related to higher smoking rates for males and females across the EU, while lower income is an important predictor for higher smoking rates in males only[57].

Inequalities in smoking are clearly reflected in inequalities in lung cancer rates as people from lower socioeconomic groups are twice as likely to die from lung

cancer compared to those from higher socioeconomic groups[58]. However, non-smokers from lower socioeconomic groups live longer compared to smokers of higher socioeconomic class, emphasizing the crucial contribution of smoking to social inequalities and health[59].

The association between health behaviours and poverty, including smoking, can arise from both the direct effects of poverty on health behaviour and lower access to education and information[60]. Those who can least afford to smoke have the highest cigarette consumption, are less likely to give up smoking, and also experience the highest burden of diseases caused by smoking[61]. There is a range of possible reasons for the higher smoking prevalence among people with lower socioeconomic status including higher smoking initiation rates, lower levels of awareness of health effects of smoking, stronger nicotine addiction, and a tendency to value potential losses in the future less[60-62]. In a study looking at smoking initiation, progression and cessation in relation to socioeconomic status it was found that parental socioeconomic status in childhood was a significant predictor of smoking behaviour and socioeconomic status in adulthood and had a significant influence on smoking progression and cessation[54]. However, a socioeconomic gradient is present only for daily smoking, but not with non-daily smoking as the latter is equally common among people with low or high socioeconomic status[63].

1.7 Tobacco control

According to the World Health Organization's (WHO) definition, "tobacco control is a range of supply, demand and harm reduction strategies that aim to improve the health of a population by eliminating or reducing their consumption of tobacco products and exposure to tobacco smoke"[64].

Tobacco control is mainly aimed at:

- Influencing the behaviour of current and future tobacco users (preventing young people form starting and motivating current smokers to quit);
- Limiting the influence of the tobacco industry on the behaviour of smokers and potential smokers;
- Reducing harm related to the use of tobacco products both to smokers and non-smokers[65,66].

1.7.1 Tobacco control implementation

Legislation is one of the main tools used in public health, and tobacco control is not an exception. In some countries the history of tobacco control laws goes back to the 17th century (Russia) or the 19th century in some states of America[67] though the history of tobacco control has generally been characterized as "too little too late"[65]. However, after the health effects of tobacco were first researched and published, many countries and international organizations have been particularly active to protect population health through tobacco control[67], culminating at the international level with the WHO Framework Convention on Tobacco Control (FCTC), which describes principles for developing national tobacco control and guidelines for implementing best practice[68].

Along with legislation, tobacco control practice has also included voluntary agreements between tobacco industries and government, an example of which is the 1998 Master Settlement Agreement in the United States (US), which was signed by 46 US states and four main tobacco companies. This agreement prohibited any kind of youth targeting in advertising, forbade using free samples as a marketing tool for attracting youth, limited sponsorship of tobacco brand names, agreed on the elimination of outdoor advertisements, prohibition on payments to place tobacco products in the media, agreed on a minimum pack

size of twenty cigarettes, and provided public access to tobacco industry documents. However, a study analysing trends in expenditure for advertising in youth-oriented magazines demonstrated that the Master Settlement Agreement had little impact on cigarette advertising in magazines[69,70], suggesting that voluntary approaches are an ineffective means of changing the behaviour of the tobacco industry. Also, in the UK there was a series of voluntary agreements between the tobacco industry and the government in 1970s, 1980s and 1990s[71]. Evidence from the UK also confirmed that the voluntary approach has not appeared to be an effective tobacco control measure[72].

Along with various tobacco control policy instruments social coercion has been one of the most effective forms of tobacco control. For example, a social taboo against women smoking, which is still present in countries in Middle East or China, has resulted in much lower female smoking prevalence compared to male smoking prevalence[65].

At the national level, countries often have a strategy or plan for tobacco control which is implemented through legislation.

1.7.2 Factors affecting implementation of tobacco control

Although there is evidence on individual characteristics that increase the risk of being a smoker (smoking is more common among men, people of younger age groups and in lower socio-economic groups) no published information exists on factors other than tobacco control implementation affecting smoking prevalence at national level.

As the implementation of tobacco control policies affects the tobacco industry it is likely that the industry attempts to undermine these policies. The WHO has

identified following strategies used by the tobacco industry to resist implementation of effective tobacco control[73]:

- Monitoring opponents and social trends to predict changes in future;
- Using the media to influence public opinion;
- Providing funding for political parties to receive legislative favours from politicians;
- To influence political processes by lobbying;
- To recruit independent experts who criticize tobacco control initiatives;
- To provide funding for research that undermines existing evidence on health effects of tobacco use;
- To organize smokers' rights groups;
- To mobilize farmers, retailers or other groups involved in tobacco production and sale with a view to influencing legislation;
- Philanthropy;
- To promote voluntary measures as an effective way to address tobacco control and to refer to corporate social responsibility
- To advocate smoking as an adults' choice and support youth prevention programmes and retailer education programmes;
- To challenge laws
- To undermine tobacco taxation and marketing and trade restrictions through smuggling.

There have been a few case reports on the tobacco industry attempts to undermine implementation of tobacco control which have been possible due to corrupt governments, for example, in Philippines[74] or Indonesia[74]. However, there is no evidence on whether tobacco control implementation in the EU is affected by corruption and any other national characteristics.

1.8 Effective tobacco control policies

1.8.1 Effective tobacco control policies

While evidence for effective tobacco control policies has been available for decades, governments in many countries have failed to implement all necessary tobacco control measures. Many arguments have been used to justify insufficient activity in tobacco control, including a lack of adequate resources for implementation of tobacco control policies in poorer countries, lack of adequate evidence for a particular tobacco control measure and perceived potential negative impact on a country's economy[76], and lobbying by the tobacco industry and related special interest groups. However, even among developed high income countries, disparities in the implementation of tobacco control policies exist highlighting the fact that being wealthy does not necessarily guarantee comprehensive tobacco control policy.

The WHO in partnership with the World Bank has identified the six most effective tobacco control policies:

- bans of advertising and promotion;
- bans or strong restrictions on smoking in workplaces and public places;
- use of warning labels on tobacco products;
- price increases adjusted for inflation rates by increasing tax on tobacco products;
- treatment and cessation services;
- information to consumers, and education[77,78].

Each of these policies is described in more detail in the following sections.

1.8.2 The Framework Convention on Tobacco Control

In 2003, at the 56th WHO assembly, the Framework Convention on Tobacco Control (FCTC) was adopted[79] and subsequently came into force in 2005. The FCTC, which is the first international public health treaty, identifies the importance of the health burden caused by tobacco use and specifies effective preventive strategies. Currently, 174 countries (parties) have signed the FCTC, and the majority of these have ratified it[68], and all 27 current EU Member States have ratified the FCTC.

The FCTC consists of 38 Articles divided in eleven parts outlining core principles for effective tobacco control. Guidelines are also published to advise countries on the implementation of the actions required by the FCTC, for example, guidelines for implementation of Article 11 of the FCTC (packaging and labelling)[80], Article 13 (advertising, promotion and sponsorship)[81] and Article 5.3. (tobacco control protection from commercial interests)[82]. The FCTC focuses on both supply and demand reduction. The demand reduction measures include price and tax measures, and non-price measures comprising protection from environmental tobacco smoke, regulation of tobacco product content and product disclosures, packaging and labelling, education, advertising and promotion restrictions and measures concerning treatment and smoking cessation services. Supply reduction measures include reducing illicit trade, sales to minors, and developing alternatives for tobacco growing[64].

1.9 Tobacco promotion and advertising

1.9.1 Aim of tobacco advertising

Advertising can be defined as the use of media to create positive product imagery or positive product association, while promotion (marketing) is the mix

of all activities that are used to increase sales[83]. The main aim of tobacco advertising is to make consumers believe that the tobacco products have desirable characteristics (various types of pleasure) while ignoring undesirable attributes such as adverse health effects[84]. In contrast, advertising bans are aimed at reducing exposure to pro-tobacco marketing[85].

For a long time, advertising has been used by the tobacco industry to encourage people to smoke by glamorizing the smoking experience and informing consumers about development of new products. Although the tobacco industry has consistently denied that their advertising is aimed at young people[86], this group is highly likely to be influenced by the marketing strategies used by tobacco companies[87]. Exposure to tobacco advertising and promotion is associated with future smoking among adolescents[88]. Some studies also confirm an exposure- response relationship[87]. Comprehensive advertising bans are therefore an effective means to prevent youth from taking up smoking, and reduce the amount of tobacco products consumed[89]. Evidence from the UK suggests that after the implementation of the comprehensive ban in 2003, there was a reduction in noticing tobacco marketing and promotion compared to other countries without similar changes in advertising regulations[85].

1.9.2 Tobacco advertising and consumption

Public health practitioners argue that advertising tobacco products leads to an increase in aggregate consumption and therefore that bans on advertising would result in reduction of tobacco consumption. Although the tobacco industry argues that aim of advertising is to influence relative market shares but has no effect on uptake[90], research findings confirm that tobacco companies try to increase sales using advertising and product innovations rather than by reducing prices[83]. Also,

a report by Dr.Clive Smee (Smee report) confirmed that advertising leads to an increase in consumption, which cannot be attributed to other factors[91].

Estimates of the strength of the effects of advertising restrictions on consumption of tobacco products varies depending on the strengths of restrictions[89], however in many studies a significant negative effect on the consumption as a result of advertising restrictions has been reported[48]. In many countries restrictions on smoking advertising in media have been in place since the 1970s[48]. In the US, where the first radio and television advertising bans came into force in 1971, several studies have found that aggregate consumption was significantly decreased following the advertising ban. Similarly, studies on a comprehensive advertising ban implemented in Australia in 1976 suggest that it had a negative but not significant effect on cigarette consumption[89]. A study in Finland suggested an effect similar to that in the US indicating a significant decrease in cigarette consumption (about 7%) after a complete advertising ban in 1977. However, the impact of other tobacco control policy changes was not considered when estimating the decrease in consumption. Also television advertising bans in Spain resulted in a decrease in aggregated cigarette consumption, while no significant decrease in tobacco consumption was observed following the TV tobacco advertising ban in Great Britain in 1965[89] though this did not put an end to tobacco advertising through sport and sponsorship.

Advertising bans which do not include all possible media are likely to be undermined by substitution with advertising in other media and sponsorship. The World Bank concluded that sufficiently comprehensive bans result in a significant decrease in tobacco consumption, while limited restrictions have very little or no effect[48]. It has been predicted that implementation of advertising bans in the EU could potentially result in a 7.9% drop in cigarette consumption[92].

1.9.3 Other tobacco advertising and marketing strategies

When tobacco advertising is banned in commonly used channels, tobacco product point-of-sale displays emerge as a key method for promotion/advertising tobacco products. Point-of-sale displays can influence brand switching[93], promote uptake of smoking by young people, encourage unplanned purchases among adult smokers, and undermine quit attempts among those trying to quit[94]. In a qualitative study it was found that point-of-sale displays were attractive to younger age groups (including 11-13 year olds), being described as likely to encourage smoking or purchase[95]. The evidence suggests that exposure of adolescents to tobacco products in point-of-sale displays increases susceptibility to smoking, and the likelihood of experimentation and smoking uptake in adolescents[96,97]. Adolescents are exposed to point-of-sale displays primarily by visiting shops close to their home and schools, and research in North America suggests that after adjusting for socioeconomic variables, smoking prevalence tends to be higher in schools with a higher density of tobacco outlets in their surrounding area[98], and in schools in which more in-store promotion of tobacco products is present in neighbourhood stores[99]. Tobacco industry representatives often make these displays more attractive by adding bright colours, and large fonts for price promotion. Young people tend to remember seeing point-of-sale displays more often than adults, suggesting that youth is more susceptible to point-of-sale displays as a form of advertising. Additional benefits are offered for retail shops and displaying tobacco products in a certain way is rewarded by various financial incentives[94]. Tobacco packaging is also used to promote smoking[100], by helping to establish brand identity, using of colours, designs and other labels to reduce perceptions of product hazard[101,102], and to reduce the impact of health warnings[103].

Several countries and jurisdictions around the world have attempted to ban point-of-sale displays including Thailand, Norway, and provinces in Canada, and

Australia. Among EU countries, the first country banning point-of-sale displays was Ireland where a complete ban came into force on 1 July 2009. Removal of point-of-sale displays in Ireland was supported by the public including smokers and appeared to be effective in de-normalising smoking[104]. Contrary to the widespread belief about threats of loses of income to retailers, removal of point-of-sale displays in Ireland did not result in a significant decline in cigarette sales over the short term when underlying trends and seasonality was considered[105]. Although no immediate decline was observed in adult smoking prevalence after the implementation of a ban on point-of-sale displays, removal of displays is likely to provide a supportive environment for those trying to quit and it is likely to result in declines in prevalence in the long term[104].

Another approach commonly used by the tobacco industry to substitute for advertising is to promote tobacco products indirectly. Despite strict advertising and promotion bans, the industry still finds different ways to reach their target audience (those who might become smokers or are already smoking). For example, in Australia following a complete ban on tobacco advertising and sponsorship, the tobacco industry was suspected to have participated in fashion industry events and club promotion parties. A marketing company 'Wavesnet' was used to organize fashion events in the clubs mainly aimed at young people, and Alpine, a Phillip Morris cigarette brand, played an important role in these events as the usual vending machines were substituted with specially designed Alpine altars. The rationale for such a marketing strategy is youth attraction to fashion icons, who they would then associate with a specific cigarette brand. However, as these events were organized by a marketing company, a direct link between these events and the tobacco industry could not be established[106,107].

Tobacco smoking is also common in movies, including those categorized as suitable for youth viewing[108], and smoking in films is a way of creating positive product imagery and associations[109]. It has been proven that filmmakers have

received financial benefits from tobacco companies in the past but no convincing evidence exist on recent agreements between tobacco and film industries. Watching smoking in movies is followed by greater experimentation among youth[109]. Once adolescents have started smoking they are more likely to notice tobacco in films[87,109] and there is a dose- response relationship between the risk of becoming a smoker and on-screen exposure to smoking[110]. Currently children and youth are not protected from exposure to tobacco in films in many countries including the UK[108].

1.10 Smoking restrictions in public places and workplaces

1.10.1 The aim of smoking restrictions

Similarly to active smoking, involuntary exposure to second hand smoke is related to adverse health effects in childhood and adulthood. Smoke-free public places and workplaces are therefore an important component of a comprehensive tobacco control policy. The main aim of smoking restrictions in public places and workplaces is to reduce exposure to second hand smoke, especially protecting vulnerable groups such as children or people with respiratory disease. Additionally smoking restrictions help to reduce smokers' cigarette consumption and motivate them to quit[111,112]. Smoke- free public places also help to shift social norms, presenting non- smoking as the predominant model[113]. Ireland was the first country to implement a complete smoking ban in workplaces and public places in 2004, but many countries worldwide have since implemented complete bans or partial smoking restrictions in public places and workplaces[114].

1.10.2 Effects of smoking bans

In 2005 in the UK it was estimated that exposure to passive smoking at work might represent one fifth of all deaths from passive smoking in 20-64 year-olds, constituting more than two employed people a day in the UK[115]. In general, the effectiveness of implemented smoke free legislation can be measured in terms of health or economic outcomes, air quality and exposure to second hand smoke, and the impact on smoking prevalence, tobacco consumption and smoking cessation[116].

Health outcomes

Health outcomes related to the implementation of smoke free measures include workers' health, especially in the hospitality industry, and general public health outcomes.

Data from the UK confirm that in the hospitality industry, work related exposure to passive smoking might contribute to up to half of all deaths[115]. The main effect of smoking restrictions is to reduce exposure to involuntary smoking and its concomitant health effects[117]. The degree to which smoke free policies affect workers' health is largely determined by the strength and enforcement of the legislation[116,118]. The 2006 law on smoking restrictions in Spain banned smoking in all indoor workplace but limited smoking restrictions in large parts of hospitality venues to partial smoking bans. In a study of people working in venues in Spain where smoking was prohibited, saliva cotinine decreased by 63.7% while a non-significant 20.3% decrease was observed among those working in venues with partial smoking bans and an increase of 20.6% in those working in venues without smoking restrictions[119].

The extent of reduction in respiratory symptoms experienced following smoking bans is estimated at around 20-50%[120], though this varies between countries

depending on comprehensiveness of implemented smoking restrictions. A comprehensive smoking ban in Ireland resulted in a significant decrease in the concentration of smoke constituents in bars and self-reported respiratory symptoms[121]. In contrast, partial smoking restrictions implemented in 2006 in Spain in hospitality venues resulted in a very little change in prevalence of respiratory symptoms 12 months after the implementation of the restrictions[118].

Smoke-free policies also influence population health outcomes, for example, hospitalization related to acute myocardial infarction. In a recent meta-analysis, it has been reported that implementation of smoke-free policies in public places results in a 17% reduction in incidence of acute myocardial infarction[122]. In England, where the smoking ban came into force on July 1, 2007, a 2.4% reduction in emergency admissions for myocardial infarction[123] was observed over 15 months following implementation of smoking ban. Similar findings were reported in Italy, where following indoor smoking bans that came into force in January 2005, a reduction in acute myocardial infarction hospital admissions that was greater in young men and people of lower socioeconomic groups was observed in the following year[124,125], who also are typically groups with higher smoking prevalence.

Air quality and exposure to second hand smoke

A complete workplace smoking ban in Spain was followed by decreased daily workplace exposure and the proportion of people exposed to second hand smoke in the workplace[126]. A study investigating nicotine concentration before and after the law revealed that median vapour phase nicotine concentrations decreased by 60% in public premises to 97.4% in private-sector workplaces. Nicotine concentration in smoke-free bars and restaurants decreased by 96.7%, in non-smoking zones of venues where smoking was allowed by 88.9%, and almost no

changes in premises and zones designated for smoking[127]. In hotel workers in Ireland, air nicotine after the smoking ban came into force in 2004 decreased by 80% and saliva nicotine concentrations by 70%[128]. Similarly, the smoking ban implemented in Brazil and Ireland also appeared to significantly reduce carbon monoxide exposure (one of the biological markers of second hand smoke concentration) in hospitality venues[121,129]. In a recent Canadian study it has been suggested that smoking restrictions should also be applied to the areas outside building entrances, as smoking outside the workplaces close to the entrance contributes to second hand exposure for non-smokers. Restricting smoking outside the workplaces to a certain distance from the entrance also helps to shift social acceptability of smoking[130].

Smoking prevalence and smoking cessation

Although the main aim of smoking restrictions is to protect non-smokers, and particularly children from harm caused by tobacco smoke, they potentially have an effect on smoking prevalence. Similarly to health effects, smoking prevalence and smoking cessation outcomes are largely determined by the extent of smoking restrictions, and effects are greater in places where comprehensive smoking bans are implemented[131,132]. A review of the effect of smoke free policies in the general population suggests that there is no evidence for consistent reduction in smoking prevalence[133]. A recent study investigating whether smoke-free policy implementation affects smoking prevalence in different countries where comprehensive smoke free policies have been implemented, confirmed that in some countries there was a significant decrease in the rate in which prevalence was declining following implementation of smoke-free policies; however in many countries no effect was observed[134]. Studies evaluating the implementation of smoke free policy in Scotland concluded that

there was a considerable increase in quit attempts prior to implementation of the smoking ban, which subsequently led to a decrease in smoking prevalence[135,136]. A study in Finland showed that implementation of smoke-free workplace policies in 1995 resulted in reduction in smoking prevalence among the employed population and to a greater extent in females (22%) than males (17%) compared to the part of population not directly affected by smoking restrictions (students, farmers)[137].

More comprehensive smoking restrictions in the workplace are associated with lower daily cigarette consumption (2.4-3.6 cigarettes per day among employees with complete or partial smoking restrictions compared to employees with no smoking restrictions in their workplace)[112,132], and greater intentions to quit smoking[112]. In Spain following smoking bans implemented in 2006, daily cigarette consumption among hospitality industry workers decreased, spontaneous quit rates reached 5.1% and salivary cotinine (which is a nicotine metabolite) decreased by 4.4%[118], even though in some places only partial smoking restrictions were implemented. In the Netherlands in a study investigating changes in smoking behaviour following the workplace smoking ban (implemented in 2004) and the hospitality industry ban (implemented in 2008) it was found that the workplace smoking ban led to decreased smoking prevalence, an increase in quit attempts and successful quit attempts[138]. However, the hospitality industry smoking ban was not followed by a decrease in smoking prevalence, and had less effect on quit attempts (OR=1.31 for workplace ban and OR=1.13 for hospitality industry ban) and successful quit attempts (OR=1.49 vs. OR=1.44) compared to the workplace smoking ban[138]. However the smoking ban implemented in hospitality venues was not comprehensive.

Economic outcomes

Representatives from the business environment tend to argue that implementation of smoke-free policies will result in a reduction of revenue, particularly in the hospitality industry. However, recent research shows that this is not likely to happen. In Tasmania, a smoke-free law was implemented in January 2006 but analysis of monthly bar turnover did not suggest a decrease in income following the smoking ban[139]. In a study carried out in Ireland no decrease in the proportion of alcohol consumption consumed in pubs was found following the smoking ban, and therefore there is no reason to think that pub revenues would decrease as a result of smoking ban[140]. These findings were also confirmed by studies in the US where restaurant[141] and bar[142] revenues did not appear to be negatively affected by smoking restrictions, and actually in places with partial or complete smoking restrictions revenues were even slightly higher compared to the places without any restrictions[141].

1.10.3 Support for smoking restrictions

Three main arguments against implementation of smoke free policies could be identified - smoking restrictions are not supported by a wider public[143], children are more exposed at home as smokers instead of smoking in public places smoke at home[140], and possible economic loses to businesses[143] (discussed above).

Regarding the first argument there have been studies investigating support for smoking restrictions in public places and workplaces. Overall, 84% of the EU population support total smoking bans in indoor workplaces and 79% are in favour of smoke-free restaurants and these restrictions are more popular among non-smokers[144]. Although among EU countries Greece has one of the highest smoking prevalences, current smokers, ex-smokers and non-smokers supported

smoking restrictions policies to various degrees with current smokers being the least supportive[145]. In Italy, the majority of the population supported the extension of smoking restriction to outdoor areas[146]. Typically greater opposition to smoke free policies is common among smokers, unmarried people, those of lower socio economic status and working in a place without smoking restrictions[147].

The most important predictors of children's exposure to second hand smoke are smoking in the home, or having smoking parents or smoking carers[148]. Therefore the fear that smokers usually smoking in pubs will increase smoking in their homes[140] and thus children will be more exposed to second hand smoke and suffer from adverse health effects, has been used against smoke free public places. However, in a study carried out in Ireland it was found that after the smoking ban came into force no greater exposure to second hand smoke was observed among children[149] and the majority of smokers (71%) did not report increased cigarette consumption at home[140]. Similar findings were reported in several English studies suggesting that over time from 1996 to 2007 there were increasing trends in the proportion of smoke-free homes, which was confirmed also by a decreasing trend in measured cotinine levels[150]. Also Spanish smoking bans in 2006 resulted in a slight decrease in second hand smoke exposure at home[126].

1.11 Use of warning labels on tobacco products

1.11.1 The aim of using warning labels

The three main reasons for using warning labels on tobacco products are to promote interest in quitting, to provide information on help available for those

wanting to quit and to inform and educate smokers about the health risks associated with smoking[151].

Using health warnings on cigarette packs has been one of the common means to communicate health risks caused by smoking. However, there is a great variation in form, size and position of health warning labels on cigarette packs used. The majority of smokers notice health warnings and this is a direct source of health information. Noticing warning labels is positively associated with health knowledge and health knowledge is related to intentions to quit smoking. As results from an international comparative study show, in countries where health warning labels are implemented the level of knowledge about health risks associated with smoking are higher compared to the countries without informative health warnings[152].

1.11.2 Evidence for the effectiveness of warning labels

In the Netherlands, an evaluation of the effectiveness of textual health warnings implemented in 2002 showed that 14% of smokers were discouraged to purchase tobacco products due to health warnings, nearly 18% reported that health warning labels had motivated them to quit, and about 10% attributed decreased cigarette consumption to the health warnings. Health warnings tended to affect women, older age groups (49 years and over) and those who were willing to quit[153]. In terms of intentions to quit smoking, combined warnings (text and graphical) were perceived as more motivating compared to text only warnings and also made smokers more worried about potential health effects. Combined health warnings compared to text only health warnings were nearly five times more effective for prevention, four times higher for motivation to quit, and nearly four time higher for preventing uptake[151].

Researchers comparing Australian, Canadian and the UK health warnings concluded that the size of the warning labels are of critical importance, especially those placed on the front of the cigarette pack[154] and large health warnings on cigarette packages are also perceived as more effective among smokers[155].

1.11.3 Pictorial health warning

Results from a study comparing the value assigned by a smoker to cigarette packs with textual warnings only and with combined warnings (consisting of graphical and textual warnings) showed that lower value was attributed to packs with graphical warnings compared to text only packs. This suggests that implementation of cigarette packs with graphical warnings might reduce cigarette consumption[156]. Pictorial warnings are more effective in communicating smoking related health risks compared to textual health warnings[155]. A study in Australia confirmed that introduction of graphic warnings resulted in more frequent talking and thinking about graphical warning messages among adolescent experimental and established smokers and increased frequency of intentions to quit smoking[157]. In the EU implementation of pictorial health warnings is supported by the majority of non-smokers (80%) and smokers (61%)[24].

Strahan et al. have suggested a range of possibilities for improving currently used health warnings[158]. According to this research group current warning messages typically include negative statements on smoking but might be more effective if stronger emphasis would be put on benefits of quitting smoking. Also, messages of quitting smoking might be effective if possible gains would be mentioned instead of commonly used threats, or possibly combining both-benefits of quitting smoking and costs of smoking. Another important predictor of quitting is subjective norms, suggesting that warning labels could have a

greater effect if they refer to salient reference groups. Health warnings could also be focused on specific attitudes of target groups, and therefore rotating multiple warning labels are useful. As adolescent smoking is more related to social interactions, health related messages might not be as effective in this group. Warning labels focusing on negative social consequences might be more useful to inform adolescents and encourage them to give up smoking. Furthermore, cigarette warning labels should also reinforce people's beliefs that they are capable of stopping smoking and provide information on help available to quit[158].

1.11.4 Plain packaging

Over the recent decades most forms of tobacco advertising in the EU have been prohibited, and perhaps as a consequence, the pack itself have since been increasingly used by the tobacco industry to promote its products.

One of the relatively recent proposals regarding labelling of tobacco products is the use of plain packaging to restrict use of logos, brand images or other promotional information. This also would enhance visibility and effectiveness of health warnings[64,80]. Current packaging of tobacco products reduces the impact of health warnings, and implementation of plain packs would remove remaining tobacco promotion [159]. As noted in the World Bank report, even in countries where smokers are relatively well informed about the effects of smoking on health, consumers are confused about actual constituents of cigarette smoke largely because of packaging and labelling[48]. The design of a cigarette pack can be targeted directly to specific group of smokers, for example, female-oriented cigarette packs are becoming a more popular market tool convincing women especially from middle or low income groups to smoke. Such pack design is very

popular among young females while plain packs are perceived as less appealing[160].

Although it is illegal in many countries to use descriptions implying that some cigarette brands are less harmful than others, youth and adult smokers perceive brands to be less harmful in the presence of specific pack design and words. For example, lighter colours of the packs are perceived as less harmful[161]. Plain packaging would overcome this influence by preventing use of any colours, brand imagery, corporate logos or trademarks; it would require the brand name to be printed only in a mandated size, font and place, adding health warnings and other information required by the legislation[159].

Currently Australia, a world leader in tobacco control, is the only country to have announced the introduction of plain packaging from December 2012[162]. However, a consultation process on the implementation of plain packaging has started in the EU (see Chapter 2) and is about to start in the UK. Chapman and Freeman argue that implementing plain packaging and banning point-of-sale displays are the two biggest threats to the tobacco industry as they restrict the industry's ability to promote their products[163]. The tobacco industry has argued that cigarette packaging is not used as a form of advertising but promotes brand switching only, and implementation of plain packaging breaches intellectual property rights. However, their efforts to undermine plain packaging suggest that the pack is an important marketing tool[159]. In the EU, the European Court of Justice has approved that plain packaging complies with property and intellectual property rights[159]. Another argument commonly used by the tobacco industry is a risk of increase in illicit tobacco as introduction would make counterfeit of cigarette packs easy. However, there are no evidence supporting this argument.

1.12 Cigarette price increase and taxation

1.12.1 Aims of tobacco products taxation

Cigarette price is thought to be one of the most important tobacco control measures. Although the main aim of the government in relation to taxing cigarettes is usually to increase revenue, given that price increases through taxation typically lead to a drop in cigarette consumption and prevalence, taxation is also an effective public health measure.

1.12.2 Effects of cigarette price increases

It has been argued that considering the addictive nature of tobacco, demand for tobacco should be inelastic; however in reality, demand is affected by price changes. Price increases encourage some people to stop smoking and may also prevent others from taking up smoking[164], though evidence on smoking initiation is inconsistent[165]. However, the evidence suggests that price increase is one of the most effective tobacco control policies[78]. In the short term, in high income countries using tax to increase cigarette prices by 10% reduces consumption by up to 6.5%[167,168], and smoking prevalence by up to 4%[169,170], independent of absolute price levels[171]. In low and middle income countries price elasticity is estimated at around -0.8, meaning that every 10% price increase would result in a decrease of cigarette consumption by 8%[169]. In low income countries, price changes tend to have a greater effect on demand, which is related to the age structure in these countries. In low income countries there is a larger proportion of younger people compared to high income countries, and young people are generally more responsive to price changes[48,172]. In Europe, a 10% price increase is estimated to result in a 7.4% decrease in cigarette consumption[173]. A smoker's current consumption level is determined by level of past consumption and the price of cigarettes; due to the addictive nature of cigarettes, smokers'

responses to price increases will be seen over a long term period as response to price changes[167].

Price increases have a greater effect on young people and those with a lower level of income. One of the main reasons why a policy of price increases is more effective in young people is a lower addiction level among younger smokers (long term users are less able to reduce consumption)[166]. Another important factor predicting responsiveness to cigarette price changes is the reason for smoking. Among youth an important reason for smoking is peer behaviour and reduced youth smoking due to price increases will result in less peer smoking and this is likely to have a multiplier effect. Thirdly, young and low socioeconomic groups spend a larger proportion of their income on tobacco products and therefore are more sensitive to price increases[174,175].

Using tax to increase cigarette prices is not popular among smokers. In the EU only 21% of smokers are in favour of tax increases. However, a greater proportion of non-smokers (71%) support such tax increases[24].

1.12.3 Types of tobacco taxation

The amount and structure of taxes levied on tobacco products varies between countries. Generally there are two types of taxes levied on cigarettes- specific and *ad valorem*. Specific tobacco taxes are added as a fixed amount of the price of cigarettes (a fixed amount of money per certain quantity of cigarettes) while *ad valorem* taxes are estimated as a proportion of a base price. The advantage of using specific tax instead of *ad valorem* tax is that specific tax allows governments to increase tax with less risk that the industry will make an effort to keep cigarette prices low[48]. Taxation should be applied to all tobacco products not only manufactured cigarettes to prevent switching between these products, for example, from manufactured to roll-your-own cigarettes[66]. Also, it has been

suggested that for maximum impact, cigarette price increases should be at least 20%, alongside an announcement of a clear strategy for further planned increases to encourage smokers to quit and prevent uptake of smoking[66].

1.12.4 Tobacco industry responses to tax increases

One of the most commonly used arguments by the tobacco industry against any tobacco control activities is that increases in taxes levied on cigarettes will lead to greater smuggling and a considerable decrease in tax revenue for governments. However, global tax revenues from tobacco products constitute only a few per cent of overall tax revenue. Also, during the short and medium term, reducing tobacco consumption by increasing tobacco excise taxes will increase revenue whilst at the same time decreasing the burden caused by smoking[176]. It is often argued that as cigarette prices go up, the risk of illegal supply increases, however, corruption is likely to be a stronger predictor for the development of illegal trade than tax increases[169].

1.12.5 Affordability of tobacco products

Affordability is a way of measuring cigarette price relative to income[177]. Using affordability measures is another approach for comparing cigarette prices between countries or over time as they adjust for the effects of differences and changes in economic growth[177]. However, so far only a few studies have been conducted investigating cigarette affordability.

Previously three measures of cigarette affordability have been used- the Big Mac index for cigarette affordability, relative income price and minutes of labour affordability[171,178]. In the study by Kan, cigarette price daily income ratio has been used, however this measure is a variation of minutes of labour

affordability[179]. Although cigarette prices are considerably higher in high income countries compared to low income countries due to large difference in income cigarettes are also more affordable in high income countries. Over time, however cigarettes have tended to become slightly less affordable in high income countries and slightly more affordable in low and middle income countries[171]. Although there is a moderate correlation between the burden of tax on tobacco products and cigarette affordability, a large part of variation in cigarette prices between countries is explained by other factors[90,180].

There have been attempts to investigate affordability of alcohol in the EU, and a positive relationship between alcohol affordability and consumption has been reported. However, affordability of cigarettes or tobacco products has not been explored and the effect of changes in cigarette affordability and smoking prevalence remains unclear.

1.12.6 Smuggling

Article 15 of the FCTC requires all parties to implement measures to eliminate all forms of illicit trade which includes smuggling, manufacturing and counterfeiting[64]. Illicit supply makes cigarettes cheap and affordable thus increasing consumption and is therefore an important issue in public health[181].

Definition of smuggling

Smuggling is defined as the evasion of excise taxes on goods by circumvention of border controls, and for tobacco typically comprises bootlegging and wholesale smuggling. Bootlegging is defined as the legal purchase of tobacco products in one country and consumption or resale in another country[182]. Bootlegging typically occurs when there are large price differences between

neighbouring countries[183]. Wholesale smuggling however occurs when tobacco products are sold without paying taxes even in the country of origin. Large scale organized smuggling accounts for the majority of global cigarette smuggling involving organized crime networks[182] and arguably is not related to price differences.

There are also means of legal tax avoidance, usually through cross- border shopping, legal tourist shopping, and legal duty- free sales. Legal cross border shopping is the purchase of cigarettes in neighbouring countries at lower prices paying all the relevant taxes within specific allowances[182]. In addition to smuggling, illicit manufacturing and counterfeit is an issue in tobacco control. Illicit manufacturing is the production of tobacco products contrary to law, while counterfeit refers to a form of illegal manufacturing using trademarks without consent[184].

Size of the problem

At the end of the 1990s it was estimated that nearly one third of global cigarette exports are diverted to the illegal contraband market[181]. In 2007 global illicit trade accounted for 11.6% of the global cigarette market, or 657 billion cigarettes a year, causing 40.5 billion US dollar tax revenue loses. In high income countries 9.8% of the cigarette market is thought to be illegal. It has been estimated that in 2007 in the EU, illicit trade was 58 billion cigarettes, placing the EU in fourth place among countries with the highest volume of cigarette smuggling following China, Russian Federation and the US[184].

Taxation and smuggling

In the 1990s Canada considerably increased cigarette taxes resulting in high prices and a drop in cigarette consumption, and there was almost a threefold difference between cigarette prices in Canada and the neighbouring US. This resulted in a massive increase in cigarette smuggling. Due to tobacco industry pressure and concerns about loses of revenue, the Canadian government decided to reduce taxes on cigarettes, which resulted in increased tobacco consumption, particularly among youth, and loss of revenue[185]. A similar tax reduction strategy took place in Sweden in 1998, when the government decided to reduce tax rates following an increase in smuggling, as prices increased by 43% over an eight month period. While the tax increase resulted in a decline of consumption and an increase in tax revenue, the subsequent tax reduction did not result in decreased smuggling[186].

Strategies to counter smuggling

Several strategies have been suggested for reducing illicit trade, for example licensing all participants in the tobacco business, use of tracking and tracing systems to follow cigarettes from manufacturing to points of sale, serious financial penalties for breaking the law and banning duty free sales. All of these strategies require international collaboration[184]. However, tobacco smuggling remains an important tobacco control issue worldwide. Some countries, like the UK, have developed national strategies to tackle issues related to smuggling. In the UK the Tackling Tobacco Smuggling strategy is a joint strategic approach between the UK Border Agency and HM Revenue and Customs, setting a range of key objectives including: strengthening local, regional and international partnerships; improving detection at the border; and increasing the impact of inland enforcement activity. This strategy has resulted in cigarette and other

tobacco product seizures, and has broken up criminal gangs involved in the large-scale smuggling[187]. In the EU, one of the initiatives to counter cigarette smuggling has been agreements with tobacco manufacturers signed by the European Anti-Fraud Office (OLAF). All four major international tobacco manufacturers (Philip Morris International, Japan Tobacco, Imperial Tobacco Limited and British American Tobacco) have agreed to combat issues relating to contraband and counterfeit cigarettes by providing funds for the EU and Member States and ensuring that their products are prevented from entering the illegal market (supplying quantities as required for legal markets, selling to legitimate clients only and implementing tracking system)[188].

1.13 Smoking cessation services

1.13.1 Aim of smoking cessation services

The main aim of smoking cessation services is to motivate smokers to quit and to provide adequate help for those smokers who are willing to quit.

1.13.2 Benefits of smoking cessation

Smoking cessation interventions are cost effective and offer very good value for money[189]. The two main benefits for smokers who decide to quit are improved life expectancy and reduced morbidity, however to the wider society, smoking cessation means reduction in exposure to second hand smoke, saving on health care and less work absenteeism due to health conditions caused by smoking.

Smoking cessation provides short and long term benefits for smokers who quit. Former smokers live longer than those who have not quit, and the impact on mortality is greatest in smokers who quit before the age of 35. Also, the

subsequent risk of heart disease decreases substantially after quitting within 15 years becoming almost the same for ex-smokers as for non-smokers[190] and risk of lung cancer stops increasing. Smoking cessation is also the most effective means of secondary prevention of chronic obstructive pulmonary disease[37].

1.13.3 Effective smoking cessation services

Pharmacotherapy

The most effective method for helping smokers to stop smoking is pharmacotherapy combined with behavioural support[191]. There are two kinds of pharmacotherapy used in smoking cessation- nicotine replacement therapy (NRT) and non- nicotine therapies[192]. Use of single formulation NRT is related to approximately 75% higher success rate in smoking cessation compared to no medications[193]. NRT works by stimulating nicotine receptors in certain areas of the brain and thus reducing nicotine withdrawal symptoms, but due to the delivery mechanism nicotine will reach the brain slower than nicotine obtained from cigarettes. NRT is available in different forms- nasal spray, oral NRT (gum, lozenges, inhalator, sublingual tablet), oral spray and transdermal patches. There are no serious harmful effects of long term use of NRT, and it is far safer than smoking. However, NRT is effective only if offered to smokers who are motivated to quit[194].

Other pharmacotherapies most commonly used for smoking cessation are buproprion and varenicline. Bupropion which was originally used as an antidepressant, is of similar effectiveness in smoking cessation to NRT if combined with intensive behavioural support[37]. Varenicline acts as partial nicotinic receptor antagonist and simulates the pleasure and reward effects of dopamine release thus reducing withdrawal symptoms[195]. It is estimated that varenicline increase likelihood of quitting by two to three times compared to

non-assisted quit attempts[196]. Use of varenicline in combination with NRT increases the success rate for giving up smoking by 42% compared to NRT only[193]. There are other medications of potential benefit such as clonidine, macamylamine and cytisine, but these are used less often.

Non- pharmacological interventions

Non- pharmacological smoking cessation methods are an important part of smoking cessation interventions[191]. Brief advice by health professionals aimed at motivating smokers to quit should be provided to all smokers when they come into contact with a health care provider[191, 192]. Even though success rates are relatively low (about 1 in 40 smokers), brief advice is one of most cost effective smoking cessation interventions because of its wide reach within a population[191].

Intensive behavioural support which includes a review of a patient's smoking history and motivation along with other support provided by trained smoking cessation advisers is another cost- effective intervention for smokers who are motivated to stop smoking. Behavioural support for groups provides additional benefit in the form of mutual support by other smokers who have decided to quit[191].

Availability of smoking cessation services

Access to smoking cessation services varies greatly across countries from places where smoking cessation support is not available at all, to countries like the UK, where comprehensive smoking cessation services are provided.

The European Network of Quitlines (an initiative aimed at maximising collaboration between Member States in smoking cessation)aims to provide

guidelines of the best practice of smoking cessation[197]. In countries where smoking cessation help is offered it is mostly available either in health care facilities or specialised smoking cessation clinics. Smoking cessation offered within health services can help to reach smokers and considerably increase the rate of quit attempts and success in quitting smoking. For example, in the UK, about 80% of people have an appointment with their general practitioner (GP) at least once a year. Although brief advice provided by their GP is effective for only about 2% of smokers, if achieved nationally this would result in 75 thousand smokers quitting annually. Therefore GPs are strongly encouraged to assess smoking status of their patients and motivate smokers to quit by recommending use of NRT[198] or referral to smoking cessation services. Smoking cessation specialist services aim to help smokers who cannot quit with simple interventions and also provide support to health professionals in delivering smoking cessation interventions[192]. In addition to smoking cessation services being available in various health care facilities, self-help materials such as leaflets can be given to smokers or advice on quitting can be provided using telephone helplines, however these methods are regarded as less effective than simple advice[191].

Recent development in providing smoking cessation services

Smoking cessation services continue to develop in line with other technological developments. Recently smoking cessation opportunities have been provided using iPhones, however currently available applications have not been effective in promoting smoking cessation, and revision and further development is suggested based on existing evidence on effective smoking cessation[199]. There have been attempts to use other mobile phone technologies as smoking cessation support. A recent study has shown that smoking cessation support using text messaging doubles quit rates at six months (biologically verified)

irrespective of socioeconomic and age groups and might be an effective smoking cessation tool[200].

1.13.4 Harm reduction

The main aim of tobacco control is to reduce the disease burden and death caused by tobacco use. The best way to reduce or eliminate potential health threats for smokers is smoking cessation, however, not all smokers are able or willing to quit. In these cases the next best option is to seek a way to reduce potential harm. Many smokers tend to reduce the number of cigarettes daily to move towards quitting or to reduce expenditure on cigarettes, however it is not clear whether reduction in number of cigarettes smoked leads to a proportional reduction in health risks as smokers might compensate it with more and deeper puffs from each cigarette[201]. Tobacco harm reduction is a controversial policy due to tobacco industry attempts in the 1970s to produce low tar cigarettes, which were claimed to be safer than conventional cigarettes[202]. Low tar cigarettes failed to reduce harm because smokers developed compensatory mechanisms of smoking to maintain their nicotine and hence tar intake[203]. Other potential options for harm reduction include use of cigars or pipes (nicotine is absorbed through buccal mucosa but only for those who aren't primary cigarette smokers), alternative cigarettes (electronic cigarettes which heat rather than burn tobacco), switching to smokeless tobacco (snuff and chewing tobacco; moist snuff- snus- in Sweden), switching to pharmaceutical nicotine products such as nicotine patches or gums, or cutting down the number of cigarettes smoked daily[201]. One of the increasingly popular options offered to smokers to reduce harm caused by smoking is electronic nicotine delivery systems (electronic cigarettes). Electronic cigarettes look like actual cigarettes however they do not contain tobacco. They consist of a metal casing within which a battery-powered atomiser produces nicotine vapour from cartridges[204]. Electronic

cigarettes contain nicotine, humectants and flavours. Visual, sensory and behavioural aspects of these devices are more similar to those of cigarettes containing tobacco than medicinal NRT which might explain why they decrease craving[205]. However, evidence on safety and efficacy of electronic nicotine delivery systems is scarce[205].

Smokeless tobacco is one of the most widely known options for harm reduction but is not harmless. Along with nicotine, tobacco specific nitrosamines are potentially harmful constituents of smokeless tobacco which vary across the different types of smokeless a tobacco. It has been suggested that use of smokeless tobacco is not related to higher risk of myocardial infarction though increases the risk of death after myocardial infarction[206]. Use of dry snuff (common in the US) is associated with about a 4.2 times increased risk of oral or pharyngeal cancer. Whilst cigarette smoking is associated with significantly increased risk of developing oral cancer, studies on Swedish moist snuff have not confirmed an increased risk of oral cancer. Increased risk of pancreatic cancer and decreased or slightly increased risk of lung cancer has been reported for snus users; however results obtained in various studies are inconclusive. An increased risk of developing cardiovascular disease, including acute cardiovascular events has been reported among smokeless tobacco users compared to never smokers, though significantly lower compared to smokers[38,207]. Even though use of smokeless tobacco can potentially cause harm to one's health it is significantly lower than the harm caused by smoking. Scandinavian smokeless tobacco has been estimated to be around 90% less hazardous than cigarette smoking[207,208]. Swedish snus contains lower levels of nitrosamines than other smokeless tobacco products due to the manufacturing and storage process. The popularity of snus increased in the 1970s and 1980s among Swedish men[202] and now is widely used in Sweden, and to large extent in Norway. Sweden is the only EU country in which snus use is legal, is also among

the countries with lowest tobacco related mortality despite a high proportion of snus users[203]. Along with health benefits for smokers, use of smokeless tobacco is not related to environmental smoke production providing additional benefits to non-smokers. There are also two main reasons for a preference of smokeless tobacco over NRT by smokers. Although nicotine absorption from smokeless tobacco is not as rapid as that from smoking, as it is absorbed into the systemic rather than pulmonary venous circulation, the levels of nicotine obtained are still significantly higher than those from NRT. Also, use of smokeless tobacco is not considered to be medical intervention and therefore might be perceived differently among smokers[208].

There are some concerns regarding promoting smokeless tobacco as a harm reduction product. Firstly, the Swedish experience might be related to culture and might not work equally well in other settings. Secondly, smokeless tobacco has its own risks, and there are concerns that the tobacco industry would use smokeless tobacco as a "gateway" to promote cigarette smoking or promote both, thus actually not reducing harm but increasing it. Thirdly, smokeless tobacco might discourage smokers from stopping smoking[202,203]. It has also been argued that the tobacco industry might target smokeless tobacco at youth. However a way forward instead of banning use of smokeless tobacco in Europe would be making it less desirable by banning flavouring additives, prohibiting advertising of all forms of tobacco products or implementing generic packaging[203].

1.14 Information campaigns

1.14.1 Aim of information campaigns

Mass media interventions include broadcasting of informative messages, and motivation to quit through television, radio, print media and billboards, and new

media channels more recently. Generally media campaigns are either directly aimed at behaviour changes of smokers or promote changes in social norms[209,210].

1.14.2 Effects of media campaigns

Media campaigns when used as a part of a comprehensive tobacco control strategy are associated with a reduction in smoking prevalence and higher quit rates among smokers when combined with other interventions[209,211]. Simulation models estimating effects of mass media interventions in the US suggested that three US dollars spending per capita on mass media campaigns would result in a smoking prevalence reduction of 2% after one year, 3% after 2 years and 6% after 10 years resulting in 17 thousand saved lives per year five years after the intervention[212]. There is some evidence that TV campaigns can lead to an increased number of calls to quit lines, however this does not necessarily result in higher successful quit attempt rates. Also, the estimated reductions in prevalence vary depending on the duration, intensity and content of media campaigns[209].

The effectiveness of information campaigns varies across the different groups of society. It has been suggested that media campaigns are effective in reducing smoking cessation disparities by socioeconomic status. However, results from a review suggest that media campaigns aimed at smoking cessation are often less effective in more deprived populations compared to groups with higher socioeconomic status. These differences could occur due to three main reasons- differential exposure across the groups, differences in response related to motivation and difference in ability to sustain cessation in the long term due to differential accessibility of smoking cessation support across the groups. However, the effectiveness of media campaigns could be strengthened if they

are implemented along with a range of other tobacco control activities, for example, availability of free NRT[211].

1.15 Smoking and youth

The majority of smokers take up smoking during adolescence, so policies aimed at youth smoking reduction would provide a long term reduction in smoking prevalence and morbidity and mortality associated with smoking.

Factors influencing smoking in young people

There are a range of factors that influence smoking uptake among adolescents- individual characteristics, close personal environment and societal factors[213,214]. Individual factors related to higher smoking rates among adolescents include age, gender, socioeconomic factors, beliefs, attitudes and knowledge. Adverse events in childhood along with some personality characteristics (extraversion, neuroticism, hostility) are related to smoking initiation[215]. Typically smoking is more common among older adolescents, and in many countries more popular in girls than in boys[213], and among young people with lower socioeconomic status[214]. Close personal environment factors influencing smoking are parental smoking and smoking in siblings and peers. This effect appears to be stronger in young age groups compared to the adults[216-218]. Having a smoking mother is related to higher risk of becoming a regular smoker than having a smoking father[28]. Along with one or both parents being smokers, exposure to smoking at home and smoking in cars, which is controlled by parents significantly increases risk for smoking initiation[219]. Parental disapproval of smoking however is found to be a protective factor and prevents adolescents from smoking uptake[220]. Societal factors affecting smoking behaviour among adolescents include social

norms, school environment, exposure to tobacco promotion including point-of-sale displays and cigarette packaging, and access to cigarettes[213,214]. Non-smoking adolescents tend to have most- anti-smoking perceptions and they tend to have the fewest of their peers who smoke and are least likely to notice others' smoking and tend to perceive that adults disapprove of smoking[221]. Whilst adult smoking is viewed as more of a personal choice driven by nicotine addiction, there is a popular misconception that child and adolescent smoking typically is related to social motives and the wish to be included in a certain social group, or peer pressure only[222] and they are not addicted to nicotine. However, the onset of nicotine addiction can be experienced in adolescence[223] and the majority of adolescent smokers consider themselves addicted[224].

Restrictions of youth access to tobacco products

Youth access laws are implemented to reduce the availability of tobacco from commercial sources to minors. The main ways of restricting youth access to tobacco is through restrictions on vending machines, age restrictions for purchasing tobacco products, and restrictions on the availability of promotional items. Another important approach for restricting youth access to tobacco products is prevention of social supply (friends, family members, strangers)[225]. Generally, there are three main things necessary to limit youth access: complete restrictions on promotional distributions (including free samples), restrictions on sale through vending machines and bans on selling single cigarettes, and licensing requirements for sellers and fines for breaking restrictions to sell cigarettes to minors[226]. Nonetheless, results on the effectiveness of restrictive policies are inconclusive. While some studies have shown some positive effect of smoking restrictions which lead to denormalising smoking, other have shown that age limits for cigarette purchase or vending machines restrictions and limits

on the distribution of free samples had little effect on adolescent smoking behaviour as they typically use other sources to obtain cigarettes[226,227]. However, restrictions on vending machines appear to have resulted in lower levels of regular smoking among adolescents[228].

Anti-smoking campaigns which include television and radio advertising and warning labels on cigarettes have been demonstrated to have some effect, however they do not lead to a great reduction in smoking prevalence among youth. An additional benefit can be obtained if thorough education on the effects of smoking takes place in schools, however there is no long term effect of such interventions in most cases[229]. Another effective measure for decreasing smoking among young people is cigarette price increases as a 10% price increase is estimated to result in 13.1% decrease in demand for cigarettes[227]. However, a recent study has shown that a high pricing policy is related to a lower smoking prevalence in boys but not girls, which might be due to the different sources of cigarettes (buying in boys vs. obtained from family or friends in girls). Although young smokers tend to smoke much less compared to adult smokers they believe quitting would be difficult. There is little evidence on the effectiveness of smoking cessation interventions in adolescents[227,230].

While it is easy and cheap to implement youth access restriction, enforcement of youth restrictions is expensive[226]. A study in the US has confirmed that strict enforcement of laws on sale restrictions to minors results in higher compliance; however it does not reduce perceived ability to purchase cigarettes by young people and consequently does not influence their smoking behaviour[231]. Many of the measures that are proved to be effective tobacco control measures, for example increase in cigarette prices or ban on advertising and promotion, are also likely to affect youth smoking[232,233]. Therefore any advances in tobacco control resulting in reductions in adult smoking are likely to help to tackle smoking issues also among young people.

1.16 Summary

The evidence presented in this chapter suggests that although over the recent decades there has been considerable progress in the development of tobacco control, smoking still remains an important public health issue causing a considerable health and economic burden. A range of effective tobacco control policies has been identified, including restrictions on advertising and promotion of tobacco products, smoking restrictions in public places and workplaces, use of health warnings, cigarette price increase, information campaigns and provision of smoking cessation services. However, the effects of these policies on smoking prevalence varies and has not in all cases been evaluated. There is large variation in implementation of effective tobacco control policies across countries and regions, and factors other than implementation of tobacco control influencing smoking prevalence at national level have not been explored. Smoking prevalence is measured to assess effectiveness of tobacco control policies, and the availability and comprehensiveness of smoking prevalence data varies across countries and data sources used; evidence on reliability of prevalence estimates is limited and non-existent in the European Union.

Chapter 2 Tobacco control policies in the European Union

2.1 The European Union

The roots of the European Union come from the European Coal and Steel Community established in 1951, however the European Union (EU) as it is currently known was established in 1992 under the terms of the Maastricht Treaty, which came into force in 1993[234]. The EU is a political and economic union consisting of 27 Member States (see Figure 2.1). Currently there are also three candidate countries- Croatia, the Former Yugoslav Republic of Macedonia and Turkey.

2.2 Decision making in the EU

There are three main institutions involved in the decision making in the EU- the European Parliament, the Council of the European Union and the European Commission[235]. The European Parliament represents citizens of the EU and is elected by them directly every five years. The European Parliament has three main functions- passing European laws jointly with the Council, democratic supervision over other EU institutions including the European Commission, and authority over the EU budget[236]. The Council of the European Union represents individual Member States (meetings are attended by one minister from each of the Member States), and is the main decision making body in the EU. The Council has several important responsibilities: passing European laws; coordinating broad economic policies of the Member States; accounting for international agreements between the EU and other international bodies or countries; approval of the EU budget; developing common foreign and security policy; and coordinating the collaboration between national courts and police sources[237]. The European Commission is independent of national governments and their role is to represent EU interests as a whole. The main duties of the European Commission are to propose legislation to the Council and Parliament,

and to ensure implementation of the EU policies and budget, to ensure enforcement of the European laws and to represent EU at the international level[238].

In general, the European Commission proposes new legislative initiatives, but the Council and the Parliament passes laws. Legislative procedures are agreed in treaties, and every new legislation initiative in a form of directive or regulation is based on a specific Article of the treaties as the legal basis[235].

The EU is political and trade partnership initially established for the purpose of economic cooperation. However, over the last few decades it has evolved and now regulates many policy areas for Member States, for example, environmental policy. Although health and safety of EU citizens is a core priority, the EU is not a health organization, and to a large extent health care and public health is regulated at national level[239].

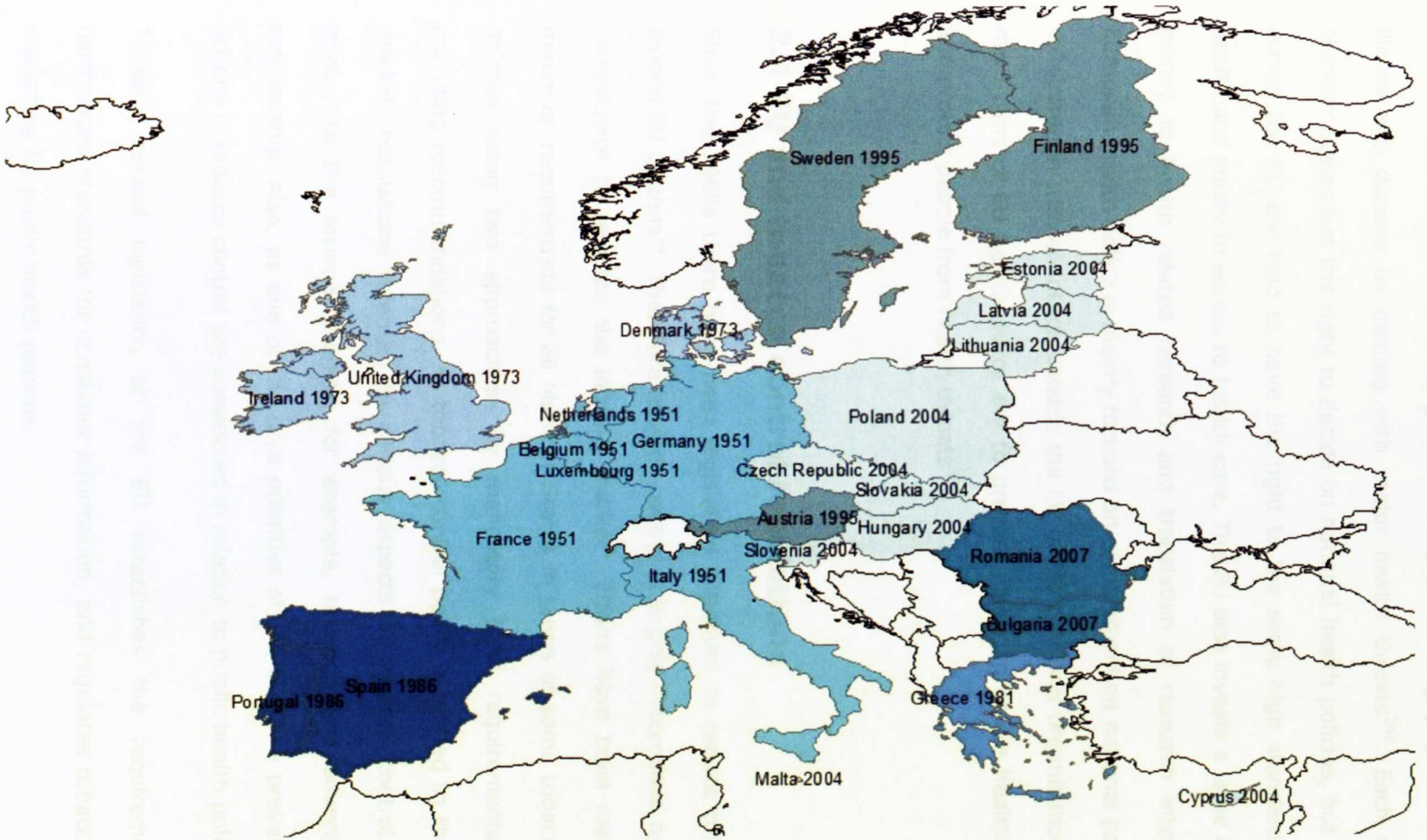

Figure 2.1: Current EU Member States and year of joining the EU

2.3 EU and public health regulations

According to the Treaty on Functioning of the European Union, EU actions should be directed towards improving public health, preventing physical and mental illness and disease by dealing with major health threats[240]. Each of the EU Member States has the right to decide on national health policies, but all people across the EU are held to have the right to the same high standard of public health and equity in access to health care. The EU also invests a large amount of money in health related research and translation of research into practice. European health policy is mainly focused on complementing national policies and collaboration with countries outside the EU or international organizations[239]. The main aims of EU health policy are to prevent illness, promote healthy lifestyle and protect people from health threats[239].

2.4 EU and tobacco control regulations

Since the 1980s there have been legislative initiatives to reduce tobacco use among EU citizens[14]. Therefore tobacco control is largely determined by the EU's competence to regulate the internal market[5]. Efforts have been made to set minimum requirements for all Member States in terms of some tobacco control policies using two approaches- by mandatory legal requirements and by providing recommendations. As tobacco control policy is related to the internal market, regulations referring to various aspects of tobacco control are also related to the internal market, for example, taxation and advertising and sponsorship. Also, as one of the core priorities of the EU is to prevent illness, actions in tobacco control are considered in relation to public health policy.

Tobacco control legislation of the EU establishes the requirements and harmonised standards for consumer information, and regulates tobacco product marketing for public health reasons.

There are five main areas covered by the EU legislation on tobacco control:

- Manufacturing and labelling of tobacco products;
- Pictorial health warnings;
- Advertising, sponsorship and promotion of tobacco products;
- Smoke-free environments[241];
- Taxation.

2.4.1 Manufacturing and labelling of tobacco products

The main aim of the Directive 2001/37/EC of the European Parliament and of the Council of 5 June 2001 on the approximation of the laws, regulations and administrative provisions of the Member States concerning the manufacture, presentation and sale of tobacco products (the Tobacco Products Directive) is to adjust national laws on maximum allowed nicotine, tar and carbon monoxide yields and measurement methods, as well as health warnings on tobacco products packaging. According to the Tobacco Products Directive, the maximum permitted tar, nicotine and carbon monoxide yields per cigarette cannot exceed 10 mg, 1 mg and 10 mg, respectively. This directive also defines measurement methods, and ISO (International Organization for Standardization) standards that should be used to measure the yields of tar, nicotine and carbon monoxide along with requirements for cigarette testing laboratories. Yields of tar, nicotine and carbon monoxide have to be printed on the side of tobacco product packages in national languages and occupy at least 10% of the side surface[242]. Article 6 of the Directive 2001/37/EC specifies that EU Member States shall require manufacturers and importers of tobacco products to submit a list of all ingredients and quantities of these ingredients by brand name and type, adding information on the reason why these are included. Such information should be provided on an annual basis, and Member States are responsible for

disseminating information to customers by appropriate means, however trade secrets should be protected.

In terms of labelling, the Tobacco Products Directive sets a requirement to place one of two general health warnings ("Smoking kills/ Smoking can kill" and "Smoking seriously harms you and others around you") on each tobacco product package. An annex of the Tobacco Products Directive specifies 14 additional health warnings. Health warnings need to be rotated to guarantee regular appearance of each of them. General warnings needs to be placed on the most visible surface of tobacco packaging and occupy at least 30% of the respective surface while additional warnings are placed on the other most visible surface occupying at least 40% (or larger proportion in countries with several official languages). The Tobacco Products Directive also specifies other technical requirements for printing health warnings and yield of tar, nicotine and carbon monoxide such as font size and type.

Article 7 of the Tobacco Products Directive prohibits using any text, names, trademarks or other signs stating that a particular product is less harmful than others, which resulted in a ban of the use of terms such as 'light' and 'mild' on cigarette packages. However, flavours and other descriptive characteristics such as blue or gold are permitted. According to Article 8 of the Directive, tobacco for oral use (except smoking and chewing) should not be placed on the market of the EU countries, except in Sweden which was granted an exemption for historical reasons[242].

There have been two reports on the implementation of the Tobacco Products Directive. The first report in 2005 was a summary of the implementation of the Directive identifying common issues regarding implementation and mainly focusing on the 15 countries that were Member States before the EU expansion in 2004. Some issues were identified regarding labelling, for example, adjusting

labels to the size of very thin packages, and efforts by the tobacco industry to reduce visibility of warnings. Some problems were found regarding the list of ingredients as data provided by the industry did not comply with the requirements specified in the Directive, and only 13 Member States at that time had submitted information on ingredients to the Commission[243]. In 2007 a second report on the implementation of the Tobacco Product Directive was launched which summarized opinions of stakeholders involved in tobacco control on the implementation of the directive and outlined potential areas for change. Maximum allowed tar, nicotine and carbon monoxide (CO) levels were applied in all Member States and also implementation of textual health warnings were considered to be satisfactory, however, issues regarding a common list of ingredients were not solved. The extent to which the requirements specified in the Directive should be applied to roll-your-own cigarettes and new tobacco and nicotine products entering the market were identified as emerging issues[244].

Current situation

Currently Directive 2001/37/EC is undergoing a revision. The European Commission Health and Consumer Directorate General commissioned a company 'RAND Europe' to carry out an impact assessment of possible amendments. The RAND report outlined the current situation in tobacco control in the EU and investigated further impacts on the health and economic impact of the different options provided for the amendments of the Tobacco Product Directive.

There has been a public consultation process on the possible amendments, which closed on 17 December 2010. The main objective of the public consultation process was to offer an early possibility for the public to revise tobacco control measures included in the Directive by offering a range of potential policy changes[245]. Five different scenarios were offered:- no change; no binding

measures; minimum revision of the Directive; revision of the Directive strengthening protection of vulnerable groups; and revision of the Directive with strengthening of product regulation and full implementation of the 'polluter pays' principle[246]. There were six different policy areas considered for the revision:

- Scope of the Directive- new products not covered by the Directive;
- Smokeless tobacco- lifting snus ban or ban all types of smokeless tobacco products;
- Consumer information- mandatory pictorial warnings, and generic packaging;
- Reporting and registration of ingredients- reporting format and data collection procedure;
- Regulation of ingredients- restrictions on ingredients that are added to improve taste and smoking experience;
- Access to tobacco products- sale via internet, vending machines and use of point-of-sale displays.

2.4.2 Pictorial health warnings

According to Article 5(3) of the Directive 2001/37/EC, the Commission had to adopt rules for the use of pictorial warnings to explain and warn about health consequences caused by tobacco use. This was done by the adoption of the Commission Decision 2003/641/EC on the use of colour photographs or other illustrations such as health warnings on tobacco packages. Member States are allowed to decide whether they wish to implement pictorial warnings, whether pictorial warnings shall be placed on all or some types of tobacco products. If a country has agreed to implement pictorial health warnings these should be implemented according to requirements specified in the above mentioned Commission Decision. The Decision sets up the rules for the use of colour

photographs or other illustrations on tobacco packages. Health warnings containing additional text warnings as specified in the Directive 2001/37/EC supplemented with colour photographs or other illustrations are referred to as combined warnings. Similarly to textual warnings, combined warnings should be rotated to ensure regular appearance of all warnings. According to the Decision, combined warnings have to be printed on the other most visible surface of tobacco packages and shall cover not less than 40% of the external area or more in Member States with two or more official languages. Combined warnings shall be printed in a way that they cannot be removed or damaged by opening a package of tobacco product, and additional information such as a reference to the issuing authority may be required by Member States. The Commission is responsible for regularly reporting progress of the implementation of the Decision[247]. In May 2005 the Commission adopted a library of 42 colour photographs or other illustrations which represent three different options for each of 14 additional textual health warnings[248].

Current situation

Belgium was the first EU country which implemented pictorial health warnings in November 2006. The next country was Romania where pictorial health warnings became mandatory in July 2008[244]. Other EU countries where pictorial health warnings are implemented are the UK where pictorial health warnings were used from 1 October 2008, Latvia (from 1 March 2010), Malta and France (from April 2011), and Spain (from May 2011)[249].

2.4.3 Advertising, sponsorship and promotion of tobacco products

The Directive 2003/33/EC of the European Parliament and of the Council of 26 May 2003 on the approximation of the laws, regulations and administrative provisions of the Member States relating to the advertising and sponsorship of tobacco products was adopted to address a great variation in sponsorship and advertising restrictions across the EU. The diversity of advertising restrictions had led to increasing barriers to the free movement between Member States and distortion of conditions of competition. In addition to addressing internal market issues the Directive was intended to protect public health interests. The Directive 2003/33/EC aims to approximate national legislative provisions related to tobacco products and promotion of tobacco products in press, printed publications, information society services and tobacco related sponsorship. According to the requirements of the Directive 2003/33/EC, advertising in printed media is limited to publications intended for professionals in the tobacco trade only, and to publications printed and published in countries outside the EU. All forms of radio advertising are prohibited, and radio programmes should not be sponsored by the tobacco industry. Also, the directive implies some restrictions on sponsorship and promotion of different events. If any events or activities involve or take place in several Member States sponsorship of these events is banned according to Article 5 of the Directive. This includes also prohibition on advertising if an event is transmitted to other Member States through television or internet. Additionally, indirect or direct promotion by distributing tobacco products for free in relation to events sponsorship is prohibited. Member States are responsible for setting penalties for breaking these restrictions and the Commission is responsible for reporting progress achieved. The deadline for implementation of the measures specified in the Directive 2003/33/EC was 31 July 2005[250].

All forms of tobacco advertising on television were banned in 1989 by Article 13 of the Television without Frontiers Directive (89/552/EEC). According to Article 17 of the Directive mentioned above television programmes were not allowed to be sponsored by natural or legal persons whose main activity was the manufacture or sales of tobacco products[251]. In December 2007, Directive 89/552/EEC was replaced by Audio Media Service Directive (2007/65/EC), according to which (Article 3e) all forms of audio-visual commercial communications for cigarettes and other tobacco products and sponsorship and product placement is banned[252].

In 2006 the Commission decided to take action against Member States breaking the tobacco sponsorship ban. There are three levels of action taken against Member States. Initially they receive a letter of formal notice, the second stage of the infringement procedure ("reasoned opinion") and if non-compliance continues, the Commission can refer Member States to the European Court of Justice. Action was taken against Italy, the Czech Republic, Hungary, Spain and Germany:

- Italy, where sponsorship was allowed for the events that took place in Italian territory only. However, these events might have cross- border effects if transmitted to other countries, and the Commission decided to take this case to the European Court of Justice
- Czech Republic- for extended transitional periods which are longer than the dates allowed in the Directive. The Commission had prepared a reasoned opinion.
- Hungary- had not implemented advertising and sponsorship bans for events of 'exceptional' importance for the national economy and the Commission sent a reasoned opinion.
- Spain- the Commission sent a reasoned opinion to Spain regarding three year exemption period for introducing the sponsorship ban for

sporting events which was implemented in Spain but did not comply with the EU legislation[253].

Also Germany has been taken to the European Court of Justice for non-transposition of the Tobacco Advertising Directive where Germany lost the case.

2.4.4 Smoke- free environments

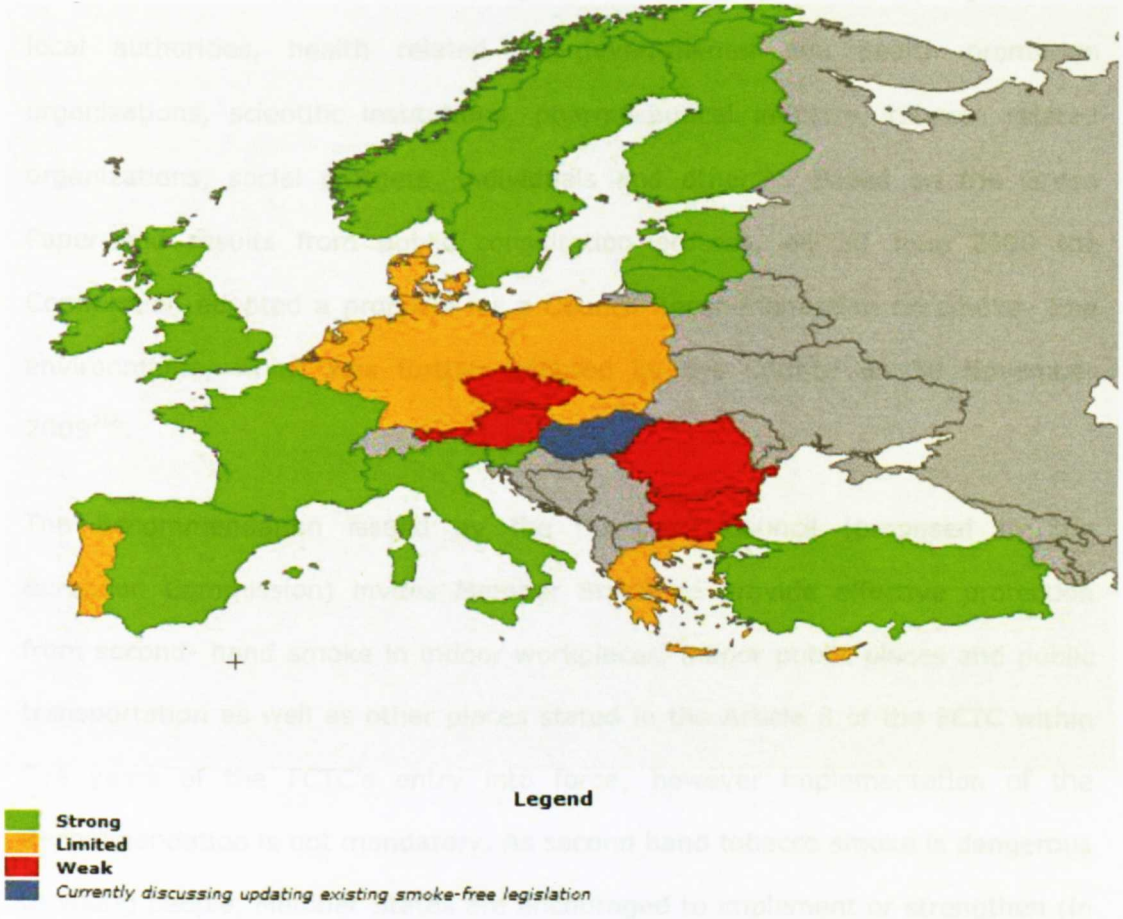

Figure 2.2: Smoke free policy as implemented in March 2011 (adopted from Smokefree partnership webpage)[254]

There is a large variation in the extent of implementation of smoke free policies across the current EU Member States (Figure 2.2). While some countries, such as the UK and Ireland have managed to implement complete smoking bans in public places and workplaces, in other EU countries such as Romania, Bulgaria or

Austria smoking restrictions are still weak and to a large extent fail to protect people from exposure to second hand smoke[254].

On 30 January 2007 the Commission adopted the Green Paper "Towards a Europe free from tobacco smoke- policy option at EU level". The aim of this Green Paper was to launch a broad public consultation process on smoke-free policies at the EU level[255]. The Commission received more than 300 opinions from various stakeholders- national governments and parliaments, regional and local authorities, health related non-governmental and health promotion organizations, scientific institutions, pharmaceutical industry, tobacco related organizations, social partners, individuals and other[256]. Based on the Green Paper and results from public consultation process, on 30 June 2009 the Commission adopted a proposal for a Council Recommendation on smoke- free environments, which was further adopted by the Council on 30 November 2009[256].

The Recommendation issued by the European Council (proposed by the European Commission) invites Member States to provide effective protection from second- hand smoke in indoor workplaces, indoor public places and public transportation as well as other places stated in the Article 8 of the FCTC within five years of the FCTC's entry into force; however implementation of the Recommendation is not mandatory. As second hand tobacco smoke is dangerous to young people, Member States are encouraged to implement or strengthen (in cases when already implemented) appropriate strategies to protect young people from exposure to tobacco smoke. Along with encouragement to protect people from exposure, the Recommendation also contains suggestions for further action in tobacco control that might strengthen the effects of smoke free policies such as promoting smoking cessation, introducing combined health warnings, developing and updating a multi-sectorial tobacco control strategy. The Recommendation also emphasizes the importance of collaboration between

Member States, exchange of information on the best practices and evaluation of policy effects. The Commission is invited to oversee and report on progress of implementation of proposed measures, and in the case of revision of the Directive 2001/37/EC consider measures to make tobacco products less attractive and analyse the legal issues and the evidence base for the implementation of plain packaging. The WHO FCTC guidelines for protection from exposure to tobacco smoke are attached as an annex to the recommendation[257]. In 2009 a report on the implementation of the Council recommendation was published stating that overall implementation was satisfactory, however some of the recommendations, for example a ban on selling cigarettes in packages containing less than 19 cigarettes or individually was not implemented across the EU[258].

2.5 Taxation in the EU

The first directive on taxation of tobacco products was adopted in the 1970s- the Council Directive 72/464/EEC of 19 December 1972 and that of 18 December 1978 on taxes other than turnover taxes which affect the consumption of manufactured tobacco[259,260]. The Directive 72/464/EEC laid down the main principles for harmonization of excise duty levied on manufactured tobacco and determined that in all Member States national and imported cigarettes are subject to a proportional excise duty calculated on the maximum retail selling price, rate of proportional excise duty and the amount of the specific excise duty must be the same for all cigarettes. The Directive used the Most Popular Price Category (MPPC) cigarette price as a reference category[259]. The MPPC is a benchmark EU price category which reflects the price of a popular brand or brands typically occupying about 35% of the national cigarette market[261]. The Directive 79/32/EEC provided definitions for tobacco products, including cigarettes (defined as rolls of tobacco capable of being smoked as they are and

which are not cigars or cigarillos and for excise tax purposes size of cigarettes excluding mouthpiece is not longer than 9 cm)[260].

In 1992 a new Directive was issued: Council Directive 92/78/EEC of 19 October 1992 amending Directives 72/464/EEC and 79/32/EEC on taxes other than turnover taxes which are levied on the consumption of manufactured tobacco. According to the Directive 92/78/EEC Member States were obliged to levy a minimum excise tax duty on cigarettes and on fine cut tobacco for roll-your-own cigarettes but the total maximum tax proportion of MPPC was not allowed to exceed 90%[262].

As it was necessary to establish levels of minimum excise tax for cigarettes, the Directive 92/79/EEC was implemented, requiring each Member State to apply an overall minimum excise duty (consisting of specific excise duty and *ad valorem* excise duty but not including value added tax (VAT)) which should be at least 57% of the retail selling price but not less than 60 Euros per 1000 cigarettes, and from July 2006 at least 64 Euros per 1000 cigarettes. For those Member States where minimum excise duty was at least 95 Euros (or 101 Euros starting from July 2006) per 1000 cigarettes there was no need to comply with the 57% requirement. Minimum excise duty estimates were revised every year using data for 1 January of each year using data on MPPC cigarette price data. Some countries were granted a transition period to implement all requirements set in the Directive 92/79/EEC[263]. Another Directive (92/80/EEC) was adopted to approximate taxes on manufactured tobacco other than cigarettes[264].

Subsequently the Council Directive 95/59/EC of 27 November 1995 on taxes other than turnover taxes which affect the consumption of manufactured tobacco came into force. This Directive defines cigarettes and other combustible tobacco products. Also, this directive specifies requirements for taxation for tobacco

products. In each Member State the specific excise tax component should be in the range between 5% and 55% of the amount of total tax burden[265].

In 2002 the new Council Directive 2002/10/EC of 12 February 2002 amending Directives 92/79/EEC, 92/80/EEC and 95/59/EC concerning the structure and rates of excise duty applied on manufactured tobacco, was adopted. Several technical amendments were necessary to ensure implementation of all requirements[266]. The Council Directive 2008/118/EC of 16 December 2008 (concerning the general arrangements for excise duty and repealing Directive 92/12/EEC) was adopted which lays down general arrangements in relation to excise duty for several groups of products, including manufactured tobacco, for example, specifying the quantity that can be transferred between Member States and regarded as items for personal use or paying excise duty when distance selling takes place[267].

The new taxation Directive 2010/12/EU of 16 February 2010 amending Directives 92/79/EEC, 92/80/EEC and 95/59/EE on the structure and rates of excise duty applied on manufactured tobacco and Directive 2008/118/EC retains similar but higher requirements for excise tax incidence (a proportion of price that constitutes tax) and rates. Also, the cigarette price reference category is changed from the MPPC to the weighted average retail selling price, which will include all cigarettes released for consumption. This directive intends to amend excise tax duty amount and structure, applying a gradual increase. The overall excise duty (specific and *ad valorem* excluding VAT) on cigarettes should be at least 57% of the average retail selling price of cigarettes but not less than 64 Euros per 1000 cigarettes. Starting from 2014, the overall excise duty proportion should be at least 60% of the weighted average selling price released for consumption. For some countries- Bulgaria, Estonia, Latvia, Lithuania, Greece, Poland and Romania- there is a transitional period for meeting these requirements until 31 December 2017. However, for countries where excise duty

is at least 115 Euros per 1000 cigarettes there is no need to comply with the 60% requirement[268].

2.6 Tobacco production/ growing in the EU

Although tobacco production in the EU is falling rapidly, 13 EU Member States currently produce a total of around 250.000 tonnes of the raw tobacco annually representing about 5% of world raw tobacco production. Italy is the biggest tobacco producer in the EU, followed by Poland, Bulgaria and Spain. However, a certain amount of tobacco is also produced in Belgium, Germany, Greece, France, Hungary, Portugal, Romania, and used to be also produced in Cyprus and in Slovakia (data for 2008 report indicated no quantity delivered meaning no production)[269]. In recent years, the raw tobacco sector has been reformed, including a payment system to encourage growing of other crops instead of tobacco.

2.7 Other EU tobacco control initiatives

The Europe against Cancer programme

The first action plan within the 'Europe against Cancer Programme' was prepared in 1986 to reduce the number of deaths from cancer in the EU by 15% by the year 2000[5]. The programme was implemented through collaboration between scientific experts, health professionals, cancer charities, anti-smoking groups, health media and national civil servants focusing on prevention, screening, education and training[270]. Within this programme, tobacco control was a part of large scale action against cancer, and one of the major points in the European Code against Cancer was not to smoke. The Europe Against Cancer Programme

had a very well designed media strategy and through media coverage also tobacco control messages got wide publicity[5].

Decision of FCTC

There is a Council Decision of 2 June 2004 concerning the conclusions of the WHO Framework Convention on Tobacco Control approving the FCTC on behalf of the EU. Up to now, 26 out of 27 Member States have approved the FCTC with the Czech Republic as the only exception.

Mass media

Along with various policy initiatives, health promotion activities have also been implemented at the EU level. The "HELP" campaign was funded by the Community Tobacco Fund delivered directly from the aid granted for tobacco production, and aimed at increasing awareness about dangers caused by tobacco use[271]. Over the period from 2005 to 2010 in the EU Member States a European Commission campaign "HELP- for a life without tobacco" aimed at smoking related issues among young people took place. This awareness raising initiative included various intervention and prevention activities employing media channels commonly used by young people[272]. HELP also contributed to academic research and established links between the tobacco control community and youth groups. The campaign was targeted at young people aged 15-24 years focusing on smoking prevention, smoking cessation and passive smoking. It was innovative in many ways- first, directly involving young people on a large scale as participants, the HELP campaign also was the first one to develop its own brand, and using youth friendly technologies. HELP activities included television/ PR campaigns, visiting schools and workplaces, and website based activities[273]. In

2010 around 43% of Europeans (and 67% of those aged 15-24) reported that they had seen HELP campaign advertising and between 2005 and 2010 the HELP website was visited 15.6 million times[273].

2.8 Differences in tobacco control implementation across EU Member States

To provide an objective mean of assessing implementation of various tobacco control policies across Europe, Joossens and Raw have developed the Tobacco Control Scale (TCS). The main aim of the TCS is to quantify implementation of tobacco control policies across the Europe, including all current EU Member States, and a few countries outside the EU-Norway, Iceland, Switzerland, and Turkey[274]. The scale considers six policies which the World Bank has described as effective in reducing harm caused by tobacco use. The maximum score is 100 and scores are allocated for the following policies:

Price policy

The maximum score for price policy is 30 and this consists of a maximum of 15 points for the price of *Marlboro* and 15 points for the MPPC cigarette price. Cigarette prices in both categories are adjusted for per capita Gross Domestic Product (GDP) expressed in Purchasing Power Standards, and the country with the highest adjusted price receives 15 points[274].

Smoke free work and other public places

The maximum score for smoke free public places is 22, and this includes workplaces (except restaurants and cafes, max. 10 points), cafes and restaurants (max. eight points) and public transport or other public places (max. four points). For workplaces, cafes and restaurants scores are allocated depending on the comprehensiveness of restrictions and the maximum is given for a complete ban which is implemented and enforced. For other public places, scores are allocated if a complete smoking ban is implemented in domestic trains (one point), other public transport (one point) and educational, health, government and cultural places (two points).

Spending on public information campaigns

Spending is estimated as a proportion of gross domestic product (GDP), and the country with the highest level of spending received 15 points.

Comprehensive bans on advertising and promotion

The maximum number of points that can be received for advertising and promotion restrictions is 13, which consists of three points for a complete ban on tobacco advertising in television, two points for a complete ban on outdoor advertising, two points for a complete ban on advertising in print media, two points for a ban on indirect advertising (including branded items), one point for a ban on point of sale advertising, one point for a ban on cinema advertising, one point for a ban on sponsorship and additional 0.5 points are allocated for a ban on internet advertising and 0.5 points for a ban on radio advertising.

Health warnings

The maximum number of points for health warnings is 10, which consists of two points for rotating warnings, four points for size of warnings (=<10%- one point; 11-25%- two points; 26-40%- three points; 41+%- four points). Additional points are given for the use of contrasting colour for health warnings (one point) and implementation of pictorial warnings provides an additional three points.

Treatment services

A maximum of 10 points are allocated for treatment services. For example, the existence of a national quitline which is well funded in a country would receive two points while a national quitline with limited funding or a patch work of small local quitlines would receive one point. For a network of smoking cessation support and reimbursement of treatment, a maximum of three points is possible for each, depending on the coverage of network (whole country, few centres etc.) and whether treatment is provided for free. A country can receive up to an additional two points if pharmaceutical treatment is reimbursed.

Up until now the TCS scores have been estimated on three occasions- in 2005, 2007 and in 2010. While 2005 and 2007 results were easily comparable as the same methodology was used, for 2010, the TCS methods for score allocation were changed therefore they were not directly comparable with the results from the previous years. Even though scores were allocated to the same six tobacco control policies and maximum scores remained the same, several changes were implemented:

- Price- while in 2005 and 2007 countries with maximum price received maximum points, in 2010 the country that had reached 7.50 Euros

per pack (adjusted for purchasing power standards, PPS) received maximum points.

- For smoking bans in public places stricter criteria were used to evaluate enforcement (verified by Eurobarometer data) and the term 'meaningful restrictions' was defined.
- Public information campaign spending- countries that spend 2 Euros per capita (PPS adjusted) receive 15 points while in previous years, the maximum points were given to the country with the highest spend
- Advertising bans- in 2010 two points were added for a ban on point of sale displays and one point for implementation of standardised packaging. As overall scores for advertising did not change, these three additional points were obtained by allocating fewer points for a complete ban on tobacco advertising on television (from 3 to 2), on advertising in print media (from 2 to 1.5), on indirect advertising (from 2 to 1), and a ban on radio advertising did not receive any scores (from 0.5 to 0).
- Health warnings- an additional four points were given for plain packaging. As overall scores for health warnings remained unchanged, these four additional points were obtained by reducing points allocated for size of the warnings (from maximum of 4 to 3), no points were allocated for contrasting colour (from 1 to 0), no points were allocated for rotating warnings (from 2 to 0) and the number of points allocated for pictorial warnings remained unchanged (maximum of 3), but scores were allocated separately for pictorial warnings in cigarette packs and hand rolling tobacco (while in previous scale yes/no only).
- Treatment- changes were made for treatment evaluation by allocating scores for recording of smoking status and having a reimbursement scheme[275].

An analysis of TCS scores by country shows there is a large variation in extent to which various tobacco control policies are implemented in the EU. Ireland and the UK had the highest ranking for all three years when TCS scores were analysed while Greece, Austria and Luxembourg had the lowest scores. A comparison of scores between three occasions when TCS was analysed also suggest that some countries, for example, Romania and Latvia between 2005 and 2007 has made important progress in tobacco control while in countries like Austria and Luxembourg no or very little improvement over five years has been observed. A summary of TCS scores for each EU country for all three occasions is presented in Table 2.1.

Table 2.1: Tobacco Control Scale scores for 2005, 2007 and 2010[274-276]

	Price			Smoking bans in public places			Spending on tobacco control			Advertising restrictions			Health warnings			Treatment services			Total scores			Overall ranking		
Country	2005	2007	2010	2005	2007	2010	2005	2007	2010	2005	2007	2010	2005	2007	2010	2005	2007	2010	2005	2007	2010	2005	2007	2010
UK	30	30	26	1	21	21	15	15	8	11	11	9	6	6	4	10	10	9	73	93	77	2	1	1
IE	23	23	27	21	21	21	3	3	1	12	12	12	6	6	2	9	9	6	74	74	69	1	2	2
FR	23	21	21	6	12	17	4	3	1	11	11	9	6	6	1	6	6	6	56	59	55	9	7	6
FI	18	17	17	12	12	17	1	2	2	13	13	10	7	7	2	7	7	4	58	58	52	7	8	7
MT	19	22	19	17	17	17	3	3		9	12	9	7	7	1	7	1	6	62	62	52	5	5	7
SE	19	19	17	15	15	15	2	1	2	13	13	10	6	6	1	5	7	6	60	61	51	6	6	9
BE	16	16	17	8	13	13	2	3	2	12	12	8	7	9	4	5	5	6	50	58	50	12	8	10
IT	16	17	16	17	17	17	2	1		10	10	8	6	6	1	6	6	5	57	57	47	8	10	12
DK	17	16	16	3	3	11	2	3	3	10	10	8	6	6	1	7	7	7	45	45	46	17	20	13
ES	12	12	14	3	15	17	3	5	1	3	12	9	6	6	1	4	5	4	31	55	46	26	12	13
NL	16	14	16	9	9	13	4	4	1	12	12	9	6	6	1	5	5	6	52	50	46	10	14	13
RO	13	18	21	6	8	7	0	1		0	12	7	3	6	3	5	5	7	27	50	45	29	14	16
LV	9	9	18	6	12	14	1	4		6	9	9	6	6	3	1	1	0	29	41	44	28	24	17
SI	13	12	13	6	6	15	0	0		7	12	9	6	6	1	4	4	6	36	40	44	22	25	17
PT	17	20	18	5	5	11				10	10	8	6	6	1	1	1	5	39	42	43	19	23	19
EE	14	11	14	9	13	12	2	5		11	13	10	1	6	1	8	8	6	45	56	43	17	11	19
PL	16	14	15	10	12	11	0	0		12	12	9	6	6	1	6	6	7	50	50	43	12	14	19
LT	11	10	17	6	14	12	1			9	10	8	6	6	1	1	4	3	34	44	41	25	21	22

SK	18	17	15	8	8	10	0	0		11	11	9	6	6	1	6	6	6	49	48	41	14	17	22
BG	19	22	21	6	8	6	0	0		9	12	10	6	6	1	6	6	2	46	54	40	16	13	24
CY	21	17	14	6	6	11	1			12	12	10	6	6	1	5	5	4	51	46	40	11	19	24
DE	20	19	17	2	2	11	0	0		4	5	4	6	6	1	4	5	4	36	37	37	22	27	26
CZ	12	13	14	6	6	7	0	0		9	10	8	6	6	1	5	5	4	38	40	34	20	25	27
HU	17	14	15	6	6	6	1			10	10	7	6	6	1	7	7	5	47	43	34	15	22	27
LU	7	6	5	4	11	11	0	0		5	9	9	7	7	1	3	3	7	26	36	33	30	28	29
AT	14	13	13	4	4	7	0	0		4	9	7	6	6	1	3	3	4	31	35	32	26	30	30
EL	17	15	15	7	7	7	0	0		4	4	6	6	6	1	4	4	3	38	36	32	20	28	30

* ranked by total TCS scores in 2010

** table produced using scores and ranking published by Joossens and Raw

*** in cases when more than one country had the same scores better ranking position was given (for example, if two countries had equal scores both would be ranked as 2 but the country with the next highest scores- as 4; this has resulted in some missing ranks)

2.9 Justification for thesis

Evidence presented in the first two chapters of the thesis suggests that a range of tobacco control policies are effective in reducing harm related to tobacco use, and efforts have been made at the EU level to control tobacco. Although the main focus of the EU is economic cooperation and the internal market, public health is among the priority areas, and there are some aspects of tobacco control that are regulated by the EU. However, providing comprehensive data on smoking prevalence and strict guidance and regulations on as many aspects of tobacco control as possible would be beneficial for all Member States, and currently the EU has not used this opportunity fully. Data of good quality on smoking prevalence are needed in order to assess the impact of implementation of various tobacco control policies. First, therefore, available data on youth and adults smoking prevalence were obtained and compared between different data sources and across the EU as well as trends over time for individual countries.

The Tobacco Control Scale indicates that there is a large variation in implementation of tobacco control policies across the EU. Over recent years, some EU countries, for example the UK and Ireland, have experienced rapid development of tobacco control policy, while others have experienced very little improvement. I have therefore endeavoured to explore why this might be the case, assessing a range of factors which might influence tobacco control policy implementation and smoking prevalence. In addition, pricing policy, as the most important policy included in the Tobacco Control Scale, was investigated across the EU using various measures for cigarette affordability. Although the EU has common minimum requirements of taxation, prices of cigarettes differ significantly between countries. Therefore cigarette prices in relation to income using measures of affordability were explored.

2.10 Aims and objectives

The main aim of the thesis was to investigate smoking prevalence and implementation of tobacco control policies across the EU. The thesis was designed to evaluate reliability of available smoking prevalence measurements, identify gaps in the existent evidence on tobacco control policies in the EU, and address these gaps by conducting appropriate studies. Through constraints on time and resources it was not possible to address all aspects of EU tobacco control in this single thesis, which instead focuses on the following main objectives:

- To assess the reliability of adult smoking prevalence estimates across the EU countries and assess changes over time across the EU (Chapter 3);
- To measure and compare smoking prevalence estimates in young people across current EU Member States and trends over time, and to assess the reliability of these measures (Chapter 4);
- To assess factors influencing the implementation and enforcement of some tobacco control policies across the EU (Chapter 5).
- To investigate cigarette affordability and changes in it in relation to taxation and smoking prevalence (Chapter 6 and Chapter 7);

Chapter 3 Smoking prevalence in the European Union: a comparison of national and transnational prevalence survey methods and results

3.1 Introduction

As described in Chapter 1 smoking has been prevalent in Europe since the early 20th century[18], and for many years has been the largest avoidable cause of serious disability and mortality in the European Union (EU)[277]. Given the scale of this problem, accurate measurement and monitoring of trends in smoking prevalence in EU countries should be a high priority.

3.1.1 Definition of smokers

The World Health Organization (WHO) has defined subgroups of smokers depending on their smoking behaviour. A population can be divided into smokers and non-smokers. However, lifetime smoking status can also be described as ever smokers (have ever smoked at least 100 cigarettes) and ever daily smokers (those who are current daily smokers, reducers or ex-smokers). Daily smokers include those who smoke at least once a day, and occasional smokers those smoking less than once a day. There are also several subgroups of occasional smokers- reducers (those who used to smoke every day but do not smoke daily at the time of the survey), continuing occasional smokers (have never smoked daily but have smoked at least 100 cigarettes and presently smoke occasionally) and experimenters (have smoked less than 100 cigarettes in their lifetime, but smoke occasionally). There are also three types of non- smokers- never smokers (never smoked or never smoked daily and have smoked less than 100 cigarettes in their lifetime), ex-smokers (used to smoke but have stopped), and ex-occasional smokers (have never been daily smokers but have smoked more than 100 cigarettes in their lifetime)[278].

3.1.2 Recommendations for measuring smoking prevalence

There have been suggestions for the most suitable ways to measure smoking prevalence by using certain questions that help to detect specific groups of smokers (daily, regular, occasional) and describe their smoking behaviour.

To measure established smoking and exclude experimental smoking a question on whether a person has smoked at least 100 cigarettes in his/her lifetime is used as an international standard. However, 100 cigarettes is an arbitrary measure only. The WHO estimates that 100 cigarettes is equal to occasional smoking for about one year[278]. According to the Health Canada guidelines current smoking status should be detected by asking "At the present time, do you smoke cigarettes every day, occasionally, or not at all?" When established smokers are detected their smoking habits need to be further explored with regard to cigarette consumption. Typically seven days or 30 days recall of smoking habits is used in surveys. seven days recall can provide consumption description in more detail while 30 days cigarette smoking history could possibly be a more representative measurement for those smoking occasionally only[279].

According to the WHO, smoking prevalence can be measured accurately by asking following questions:

- Have you ever smoked (Yes/No)
- Have you ever smoked at least 100 cigarettes or equal amount of tobacco? (Yes/No).
- Have you ever smoked daily? (Yes/No)
- Do you now smoke daily, occasionally or not at all?
- On average, what number of the following items do you smoke a day (manufactured cigarettes/ hand-rolled cigarettes/ bidis/ pipefuls of tobacco/ cigars (cigarillos)/ goza (hookah)?
- How many years have you smoked/ did you smoke daily?

- How long has it been since you last smoked daily (less than one month/ one months or longer but less than six months/ six months or longer but less than one year/ one year or longer but less than five years/ five years or longer but less than 10 years/ 10 years or longer)[278].

Using all of the questions of the list above would provide complete information on prevalence of smoking, however as questions regarding smoking are often included as a part of larger public health surveys, and the above questions take some time to complete, they are often not used as recommended.

3.1.3 Measurement of smoking in the EU

Over the past 15 years the European Commission (EC) has measured smoking prevalence in all Member States on five occasions, in Eurobarometer surveys carried out in 2002, 2005, 2006, 2008 and 2009[280-283]. The surveys use samples of about 1000 participants from most countries and the published reports contain no detailed breakdown by gender, age or other characteristics by country. Smoking prevalence is also measured in national surveys in Member States, usually with larger samples and hence more detail than the Eurobarometer, but with different questions and varying frequency.

3.1.4 Discrepancies in smoking prevalence estimates

Inspection of national and Eurobarometer prevalence estimates reveals some substantial discrepancies. For Britain, for example, smoking prevalence estimates from the large and nationally representative General Household Surveys in 2002, 2005 and 2006 were 26%, 24% and 22%[284], while the Eurobarometer figures for the UK in the same years were respectively 45%, 29% and 32%[280,285,286]. This suggests either that differences in the phrasing of

questions used to define smoking, errors arising from sampling methods or sample sizes, or all of these factors, have a considerable impact on estimates from national or Eurobarometer studies, or both.

Since these considerations question the validity of the Eurobarometer surveys as the main source of smoking prevalence data for the entire EU, it is important that the methods, sample sizes and prevalence estimates provided by the Eurobarometer survey and in available national studies are studied, summarised and compared.

3.1.5 Aim of the chapter

The aim of this chapter was to determine whether the European Commission Eurobarometer survey of 27 EU Member States produces reliable smoking prevalence estimates when compared to national prevalence survey data, and to identify approaches to standardising the measurement of smoking prevalence in the EU. Since national data tend to be published rather later than Eurobarometer results and many countries do not have more recent data available, the primary comparison, carried out in 2009-10, was between data from the 2006 Eurobarometer survey, and from national surveys closest in time to 2006. Additionally, trends in adult smoking prevalence were investigated using available Eurobarometer data to explore whether consistent changes in prevalence are observed.

3.2 Methods

3.2.1 Data collection

National data

A range of internet search strategies was used to attempt to identify the most recent national survey of smoking prevalence, and a summary of the survey methods used, for each of the 27 EU countries. Typically the sources of data were surveys addressing a range of topics but included some questions on smoking. These sources usually provided details of sampling methods, sample size and phrasing of the questions used to define and measure smoking. In cases in which this methodological information was not provided or was incomplete, e-mail contact was then made with individuals or organisations given on the websites as sources of further information, and if that proved unsuccessful, the European Health Interview and Health Examination Surveys Database[287] and the WHO Global InfoBase[288] were used as secondary sources of information.

From these sources the age range and number of participants included, the response rate, and the sampling and data collection methods used for the survey were established. Attempts were made to ascertain the phrasing of the questions to determine whether they included smokers of any tobacco product or cigarette smokers only, and whether they included and distinguished between occasional and daily smokers. We were unable to ascertain further information about the Eurobarometer 2006 survey method, other than that contained in the published report. Summaries of the national surveys or complete data published in English were used when available. In other cases translation of necessary information from original publication language into English was done using translation websites, or through personal contacts proficient in a relevant language. When translation webpages were used, further efforts were made to contact

representatives from the research/ survey publishers in these countries to confirm accuracy of translation and data.

Eurobarometer data

When trends over time were investigated all available Eurobarometer surveys were included- for the years 2002, 2005, 2006, 2008 and 2009. Eurobarometer surveys investigating public opinion in the EU have been carried out for the European Commission since 1973. Major topics included in the Eurobarometer surveys are EU enlargement, social situation, health, culture, information technologies, environment, defence, the Euro and others. There are three types of Eurobarometer surveys- Standard Eurobarometer, Flash Eurobarometer and Special Eurobarometer. All Eurobarometer surveys investigating smoking and tobacco, except one from 2008, are special Eurobarometers. Special Eurobarometers are carried out to investigate a certain topic in more detail, while Flash Eurobarometers are ad-hoc telephone interviews[289]. In 2002 (using data published in Eurobarometer 2005, as the original 2002 report presented data in bar charts without exact figures) estimates for smoking of manufactured cigarettes only were available for 15 EU countries (Belgium, Denmark, Germany, Ireland, Greece, Spain, France, Finland, Italy, Luxembourg, Netherlands, Austria, Portugal, Sweden, UK). In 2005, data for 25 EU countries on smoking of manufactured cigarettes and overall smoking (including manufactured cigarettes, roll-up cigarettes and cigars and pipes) were available (data for Romania and Bulgaria on overall smoking not published, but countries were included in the survey). In 2006 data for all current EU Member States were provided both for smoking prevalence of manufactured cigarettes and overall smoking prevalence. In 2008 and 2009 all current EU Member States were included in the Eurobarometer surveys; however separate figures for smoking of manufactured

cigarettes were not available in the published reports. In 2008 Eurobarometer survey telephone interviews were used while other Eurobarometer surveys were carried out using face-to-face interviews. None of the Eurobarometer surveys provided data on smoking prevalence separately for males and females therefore pooled prevalence estimates were used for estimation of trends.

3.2.2 Data analysis

Data analysis involved comparisons of the methods used and estimates obtained in these national surveys with those in the Eurobarometer 2006 survey. Where more than one recent national survey was available data from the year closest to 2006, or from 2005 if the choice was between 2005 and 2007 were used. If more than one national survey was available in the closest year to 2006, data from the largest study were included in the analysis. To assess agreement between smoking prevalence estimates from Eurobarometer and national surveys, first the difference between these estimates was calculated by subtracting the national prevalence figure from the Eurobarometer prevalence figure, then the mean smoking prevalence for each country was estimated using both prevalence figures. The differences between surveys were then plotted against their mean in a Bland-Altman plot, and 95% difference boundaries (using t value 2.056 for 26 degrees of freedom) estimated[290]. At the time of the study it was clear that more recent data were being collected in several countries, but analysis was limited to data available at the time of writing in December 2009. The Eurobarometer 2006 study presented mean smoking prevalence in the EU using data on 25 countries only, as this study was carried out before the accession of Bulgaria and Romania (although data for all 27 countries were available) In addition, therefore, the mean Eurobarometer summary figure for all 27 EU countries adjusted for the population in each country in the age group 15+ was calculated.

Trends in smoking prevalence estimates provided by Eurobarometer surveys were investigated for individual countries using linear regression. Trends across the EU were not explored as the number of countries involved differed between Eurobarometer survey waves. When trends in smoking of manufactured cigarettes were investigated data for the years 2002, 2005 and 2006 were used and for overall smoking prevalence data for 2005, 2006, 2008 and 2009 were used. For data analysis SPSS v.17 was used.

3.3 Results

3.3.1 Comparison between national and international studies

The national surveys that were identified, phrasing of the questions used to describe current smoking (or a description of reported smoking status in cases where it was not possible to obtain specific phrasing), the age range of participants, the sampling and survey methods used, the sample size and participation rates, the prevalence estimates reported, and the equivalent information from the Eurobarometer 2006 survey for the 27 EU countries, are summarized in Table 3.1.

Year of surveys

At the time of analysis (December 2009) the majority of recent national surveys had been carried out between 2003 and 2007, with only seven countries (Finland, Luxembourg, Malta, the Netherlands, Sweden, UK and, Ireland) having data for 2008. For this reason Eurobarometer 2006 instead of more recently available Eurobarometer surveys was used, and thus also for countries with available data for 2008 or 2009 those obtained from studies closer to 2006 were used. For 11 countries data were available for 2006, for six countries- from 2007, for five countries- from 2005, for three countries- from 2004, and for two countries from 2003. For one country, Greece, no recent data on smoking prevalence were available from a national survey, and instead a prevalence estimate from a published article that quoted a recent national survey as the source of the estimate was used. Data on the sample size and age group included were also given in this secondary source, but no further information about the original survey was available. Data for the UK were obtained from the General Household Survey, which excludes Northern Ireland (3% of the UK's population).

Table 3.1: Summary of survey details and methods for 27 EU countries, and the Eurobarometer survey

Country	Survey name	Year of the survey	Main question for measurement of smoking prevalence*	Age Range	Number of survey participants	Response rate (%)	Sampling method	Data collection method	National Survey Smoking Prevalence Estimates (%)			Eurobarometer Smoking Prevalence Estimates in year 2006 (%)(all smokers included except where specified)		
									Daily	Occasional	Total	Regular	Occasional	Total
European Union[286]	Eurobarometer	2006	Which of the following applies to you? You smoke packed cigarettes/ You smoke roll up cigarettes/ You smoke cigars or a pipe/ You chew tobacco or take snuff/ You used to smoke but you have stopped.	15+	27,084 (EU 27)	NA	Multistage random sample	Face-to-face computer assisted interview			**EU25**	27.2	4.5	**32.0[#]**
											EU27 (estimated)	27.0	4.4	**31.6**

			Do you smoke regularly, or occasionally? For cigarette smokers: Do you smoke every day?											
Austria (AT)[292]	Health Interview Survey	2006/ 2007	Do you smoke now? Yes: -Daily; -Occasionally No	15+	15,474	63.1	Multistage probability sample	Computer assisted personal interview	23.2	NA	**NA**	25.1	5.9	**31.0**
Belgium (BE) [293-295]	Health Interview Survey Belgium	2004	Do you smoke now? Yes:	15+	6,530	61.4	Stratified multistage cluster sample	Self-administered questionnaire (delivered with	23.7	3.9	**27.6**	21.1	4.7[#]	**26.0**

			-Daily; -Occasionally No					personal interview)						
Bulgaria (BG)** [296,297]	National Behavioural Risk Factor Survey among Population Aged 25-64	2007	Current users: Daily/ occasional smoking	25-64	3,000	NA	Multistage cluster sample	Interviewer administered questionnaire	39.6	5.6	**45.2**	32.4	3.2[#]	**36.0**
Cyprus (CY) [298]	Health Survey	2003	Do you smoke now? Yes: -Daily; -Occasionally No	15+	5,617	91.9	Simple systematic random sample	Computer assisted personal interview	23.9	3.8	**27.7**	25.7	5.3	**31.0**
Czech Republic	Sample Survey of the Health	2004	Do you currently smoke cigarettes?	18-64	3,526	68.2	Randomized stratified	Face- to- face interview	26.8	8.8	**37.3**	26.3	1.7	**28.0** [+]

(CZ)[285]	Status and Life Style of the Population in the Czech Republic Focused on Drug Use		Yes: -Daily; -Occasionally No I don' t smoke cigarettes, but smoke pipe or cigars				(quota) sample							**(29.0)**
Denmark **(DK)**[299-301]	Health and Morbidity Denmark 2005-Development since 1987	2005	Do you smoke now? Yes: -Daily; -Occasionally No	16+	14,566	66.7	Random sample composed of two subsamples-re-interview sample and regional samples	Computer assisted personal interview; self-administered questionnaire	29.6	6.1	**35.7**	27.5	4.5	**32.0**
Estonia	Health Behaviour among	2006	Do you smoke now?	16-64	2,867	57.3	Simple random	Self-administered postal	27.8	7.3	**35.1**	28.7	4.3	**33.0**

(EE)[302]	Estonian Adult Population		Yes: -Daily; -Occasionally No				. sample	questionnaire						
Finland (FI)[303]	Health Behaviour and Health among the Finnish Adult Population	2006	Do you smoke now? Yes: -Daily; -Occasionally No	15-64	3,255	65.0	Simple random sample	Self-administered postal questionnaire	21.4	6.1	**27.5**	20.3	5.7	**26.0**
France (FR)[304,305]	Health Barometer	2005	Do you smoke now? Yes: -Daily; -Occasionally	12-75	30,514	57.9	Two stage random sampling	Telephone interview	24.9	5.0	**29.9**	29.4	3.6	**33.0**

			No											
Germany (DE)[306-308]	Mikrozensus	2005	Do you smoke now? Yes: -Regularly -Occasionally No	15+	830,000	~84.2% (tobacco questions)	One stage cluster sample	Computer assisted personal interview	23.0[++]	4.0	**27.0**	25.5	4.5	**30.0**
Greece (EL)***[309]	European Community Household Panel Survey	Published 2005	NA	25-59	5,489	NA	NA	NA	NA	NA	**40.0**	37.4	4.6	**42.0**
Hungary (HU)**[287,310,311]	National Health Interview Survey	2003	Do you smoke now? Yes: -Daily; -Occasionally	18+	5,072	72.0	Multistage cluster sample	Face-to-face interview (partly self-administered)	30.4	3.4	**33.8**	33.5	2.5	**36.0**

			No												
Ireland **(IE)**[312-314]	Survey of Lifestyle, Attitudes and Nutrition (SLAN)	2007 (data collection started 2006)	Do you smoke now? Yes: -Daily; -Occasionally No	18+	10,364	62.0	Multistage probability sample	Face-to-face interview	24.1	4.9	**29.0**	25.5	3.5	**29.0**
Italy **(IT)**[316,317]	Aspects of Daily Living	2006	Do you smoke now? Yes: -Daily; -Occasionally No	14+	48,834 (50,000 given in published report)	81.3	Two- stage stratified sample	Face-to-face interview	NA	NA	**22.7**	23.9	5.6	**31.0**

Latvia (LV)[318]	Health Behaviour among Latvian Adult Population	2006	Do you smoke now? Yes: -Daily; -Occasionally No	15-64	1,584	54.6	Simple random sample	Self-administered postal questionnaire	30.4	4.9	**35.3**	31.0	5.0	**36.0**
Lithuania (LT)[277]	Health Behaviour among Lithuanian Adult Population	2006	Do you smoke now? Yes: -Daily; -Occasionally No	20-64	1,739	59.2	Simple probability sample	Self-administered postal questionnaire	26.5	5.3	**31.8**	26.2	7.8	**34.0**
Luxembourg (LU)[319]	Tobacco in Luxembourg	2007	Daily/ occasional smoking	15+	2,523	NA	Random Quota Sampling	Face-to-face interviews	21.0	4.0	**25.0**	23.7	2.3	**26.0**

Malta (MT)[180]	Lifestyle Survey	2007	How many cigarettes do you smoke every day?	18+	1,369	68.5	Systematic random sample	Self-administered postal questionnaire	NA	NA	**26.2**	21.5##	3.5##	**25.0## (25.0)**
The Netherlands (NL)[291]	Monitoring Trends in Smoking Behaviour in Dutch Population	2006	Smoking behaviour: Smokes (daily/ non-daily) /Never smoked / Formerly smoked	15+	18,031	NA	From TNS database	Self-administered web-survey questionnaire	23.2	4.9	**28.2** +++	23.5	5.5	**29.0**
Poland (PL)[320]	Health Status of Population in Poland	2004	Do you smoke now? Yes: -Daily; -Occasionally No	15+	35,248	70.0	Stratified two stage sample	Face-to-face interview	26.3	4.0	**30.3**	30.1	4.6#	**35.0**
Portugal	Portuguese National Health	2005/2006	Do you smoke now?	10+	41,193	76.0	Stratified systematic	Computer assisted	17.6	2.1	**19.7**	21.4	2.6	**24.0**

(PT)[29,321]	Survey		Yes: -Daily; -Occasionally No				cluster sample	personal interview						
Romania **(RO)**[322]	Knowledge, Attitudes and Practices of the General Population on the Consumption of Tobacco and the Legislative Provisions	2007	Do you smoke now? Yes: -Daily; -Occasionally No	15-59	2,434	87.0	Multistage probability sample	Face- to-face interview	NA	NA	**30.0**	27.0	3.7[#]	**31.0**

Slovakia (SK)[323]	Prevalence of Drug Use in Slovakia, and Citizens' Views on the Problems Associated with Drug Addiction	2006	Occasional/ Daily smoker/ Non-smoker	18+	1,439 (data presented only for one of the three samples)	NA	Random quota sample	Telephone interview	25.0	13.0	**38.0**	20.3	4.5[#]	**25.0**
Slovenia (SI)[324,325]	European Health Interview Survey	2007	Do you smoke now? Yes: -Daily; -Occasionally No	15+	approx.2,312	68.0	Two stage probability sample	Face-to-face interview	18.9	6.0	**24.9**	17.9	5.1	**23.0**
Spain	National Health Survey	2006	Do you smoke now?	16+	29,478	64.3	Stratified multistage	Face-to-face interview	26.4	3.1	**29.5**	30.9	3.1	**34.0**

(ES)[326-328]			Yes: -Daily; -Occasionally No				sampling							
Sweden **(SE)**[329-332]	Health on Equal terms (National Sample results)	2006	Do you smoke now? Yes: -Daily; -Occasionally No	16-84	5,995	60.1	Stratified multistage probability sample	Postal self-administered questionnaire	14.1	10.4	**24.5**	14.4	3.6	**18.0**
United Kingdom **(UK)**[30,333,334]	General Household Survey (Excludes Northern Ireland)	2006	Do you smoke cigarettes at all nowadays? Yes/ No	16+	18,214	76.0	Stratified two stage probability sample	Computer assisted personal interview	NA	NA	**22.0**	30.4##	1.6##	**32.0##** **(33.0)**

* Summarised to provide key outcomes available

**Exact questions unknown; details of methodology provided from the WHO Global InfoBase

*** Details of methods unknown; data provided from secondary source

excludes small proportion of smokers for whom regular/ occasional smoking status is unknown - 0.3% Belgium, 0.4% Bulgaria, 1.6% Italy, 0.4% Poland, 0.3% Romania, 0.2% Slovakia, 0.3% EU27.

daily/ non- daily smoking of cigarettes and overall cigarette smoking prevalence (overall smoking prevalence estimate in brackets)

+ For Czech Republic national survey data on daily and occasional smoking refer to cigarette smoking only, but total figure represents overall smoking (including 1.7% cigars and pipes smokers). For Eurobarometer survey data regular and occasional smoking represents daily/ non-daily cigarette smoking and overall cigarette smoking (overall smoking prevalence in brackets)

++- represents regular smoking

+++ 0.1%- not known daily/occasional smoking status

NA-Data not available

Sampling and survey methods

The majority of countries used multistage, representative population sampling methods, and most used personal face-to-face interviews (sometimes with additional questionnaires for private completion) to collect data, though six used postal survey methods, one an online survey, and two used telephone interviews. No information was available on the data collection procedure used in Greece.

The sampling methods of the Eurobarometer survey were similar to those of the national surveys, with a lower age limit of 15 years and no upper age limit. The response rate in the Eurobarometer study was not given in the published report.

Number of participants

The number of participants in national surveys varied widely between countries, the lowest being Malta with 1369 individuals but most others including at least 3000 people. The effective sample size which includes those who were eligible and responded is presented in Table 3.1 for countries where detailed data collection procedure description was provided. The Eurobarometer survey included around 1000 people in each country, except in Cyprus, Luxembourg and Malta where approximately 500 people were surveyed, and in Germany, with 1551 participants.

Age range and response rate

All surveys imposed a lower age limit on participants (typically 15 or 16 years, but ranging from 10 in Portugal to 25 in Bulgaria and Greece); and some surveys an upper limit, usually 64 years. Available response rates varied from 55% in

Latvia to 92% in Cyprus; and the response rates were not available for five countries.

Main questions used to measure smoking prevalence

The questions on smoking used in national surveys varied markedly in phrasing, but clearly ascertained daily and occasional (non-daily) smoking in 19 countries. For clarity therefore the questions used in these countries were condensed into uniform text as presented (except minor differences in wording) in Table 3.1, and for the other countries the approximate questions used were summarised. Surveys in Bulgaria, Slovakia, the Netherlands and Luxembourg reported daily and occasional smoking, but it was not possible to establish the precise questions used. Germany reported regular and occasional, rather than daily or occasional smoking, but did not explicitly define regular smoking. For Greece the estimated prevalence was for all smoking, but the questions used were unknown. In Malta only daily cigarette smoking was measured; the Czech Republic measured all smoking but broke only cigarette smoking down into daily or occasional; and in the UK, the question asked about smoking cigarettes at all nowadays (cigar and pipe smoking were excluded, regular smoking of either being extremely rare). Questions used in Austria, Italy and Romania appeared to distinguish daily and occasional smoking, but prevalence was reported only for daily smoking for Austria, and all smoking for Italy and Romania. In some countries additional questions were asked about the number of cigarettes, cigars or pipes smoked by daily smokers, and the frequency of smoking for occasional smokers.

The questions used in the 2006 Eurobarometer survey defined a smoker as one who smoked manufactured cigarettes, hand-rolled cigarettes, cigars or pipes, and asked these smokers if they smoked regularly or occasionally. Regular

smoking was not defined in the report. Cigarette smokers were asked about daily consumption, and included a response category for those who did not smoke every day. Thus the Eurobarometer provides data on regular or occasional smoking of any product, and daily or non-daily smoking of cigarettes. Since most national surveys also measured all smoking (of cigarettes, cigars and pipes) figures for all smoking were used to compare like-with-like estimates between national and Eurobarometer surveys for all countries except the UK and Malta, for which the Eurobarometer cigarette smoking prevalence figure was used.

Smoking prevalence estimates

Since the Eurobarometer survey did not publish gender specific smoking prevalence estimates, we compared prevalence for both sexes combined although most national surveys provided sex specific prevalence estimates. In all cases attempts were made to compare overall prevalence estimates (including daily and occasional) obtained from national and Eurobarometer surveys. Although in Austria in the national survey data on daily smoking prevalence only were reported, the comparable Eurobarometer figure represented overall smoking. This was done to ensure that the mean estimates at the EU level could be compared. The estimates compared are displayed in Figure 3.1.

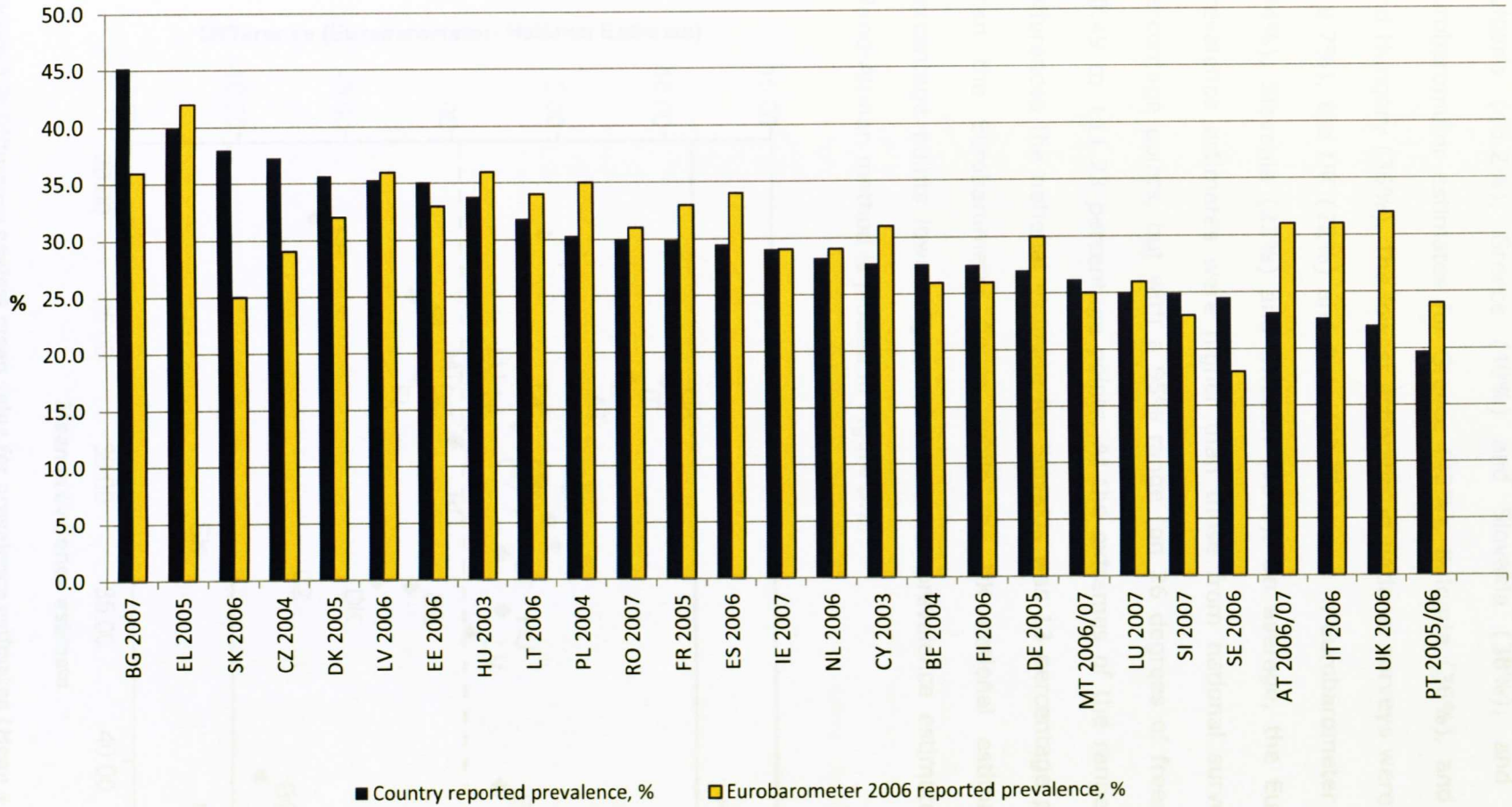

Figure 3.1: National and Eurobarometer 2006 smoking prevalence estimates for the EU countries (ranked by national smoking prevalence figures; represent overall smoking prevalence except in Austria where national data report daily smoking prevalence)

The highest smoking prevalences reported in national surveys were from Bulgaria (45.2%), Greece (40%) and Slovakia (38%); and the highest Eurobarometer estimates for Greece (42%), Bulgaria (36%), and both Latvia and Hungary (36%). The lowest estimates in national surveys were for Portugal (19.7%), the UK (22%) and Italy (22.7%); and in Eurobarometer for Portugal (24%), Slovenia (23%) and Sweden (18%). On average, the Eurobarometer prevalence estimates were higher than those from national surveys by 0.37 percentage points, but with a 95% range (on 26 degrees of freedom) from -10.49 to +11.23 percentage points. At the extremes of the range of absolute differences the national estimate for Slovakia was 13 percentage points higher than the Eurobarometer figure, while the UK national estimate was 10 percentage points lower. Agreement between prevalence estimates using the Bland-Altman method is plotted in Figure 3.2.

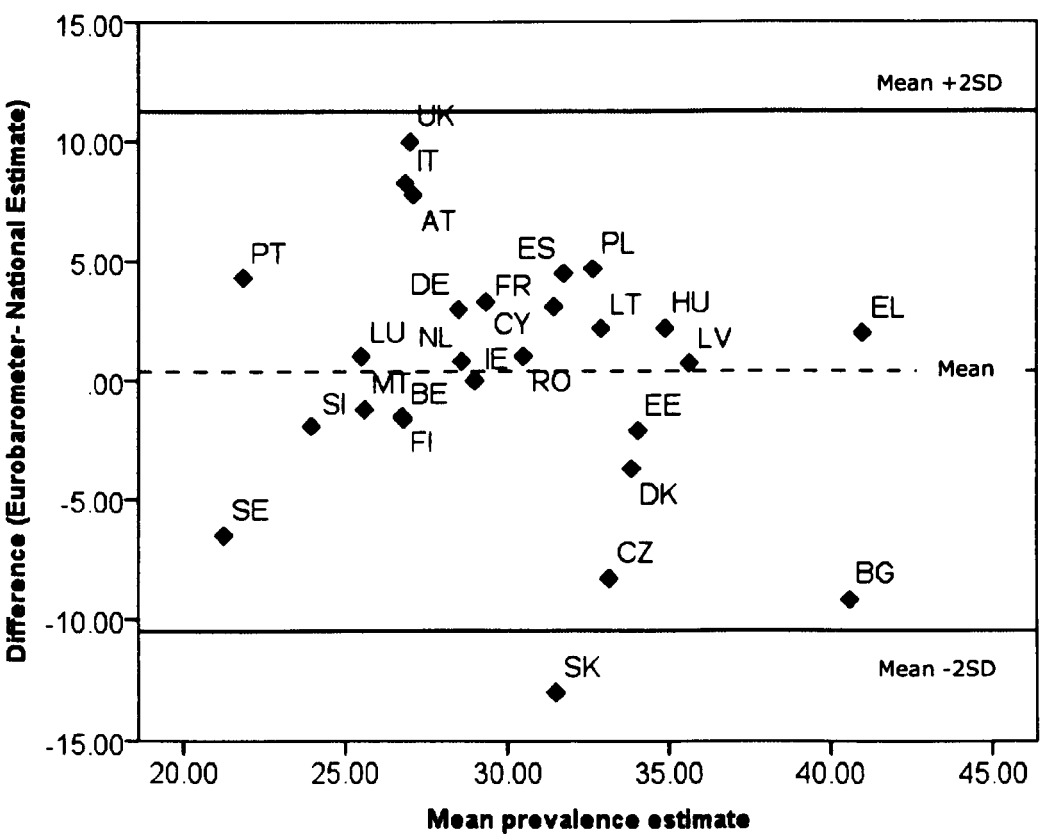

Figure 3.2: Difference against mean value for prevalence estimates (Mean +2SD and Mean-2SD represent limits of agreement)

Mean daily and occasional smoking prevalences in the 20 countries for which daily and occasional smoking prevalence figures were available were 25.1 and 5.6% respectively, and for the same countries in the Eurobarometer study, mean regular and occasional smoking prevalence estimates were 25.5 and 4.2%.

3.3.2 Investigation of trends in smoking prevalence

Smoking of manufactured cigarettes

The mean smoking prevalence of manufactured cigarettes along with countries with lowest and highest prevalence estimates are presented in Table 3.2. Overall, there appeared to be a decrease in prevalence of smoking of manufactured cigarettes, however the number of countries involved in each survey differed.

Table 3.2: Mean smoking prevalence of manufactured cigarettes (2002-2006, data from Eurobarometer surveys)

Year	Mean prevalence % (SD)	Lowest value (country)	Highest value (country)
2002	31.2 (5.3)	22.0 (SE)	39.0 (EL)
2005	28.3 (5.6)	19.0 (NL)	40.0 (EL)
2006	27.4 (5.6)	17.0 (SE)	39.0 (EL)

*15 countries included in 2002; 25 countries- in 2005 and 27 countries in 2006;

When trends in smoking prevalence of manufactured cigarettes were investigated (15 countries for which data for all three data points were available were used) including data for years 2002, 2005 and 2006 significant trends were found only in Luxembourg (b=-2.36; 95% CI -3.93; -0.79) and Portugal (b=-2.0, 95% CI -2.0; -2.0), but not in any other EU Member State (Figure 3.3). This suggests that there was a 2.36% point drop in smoking prevalence between surveys in Luxembourg, and 2% point drop in Poland.

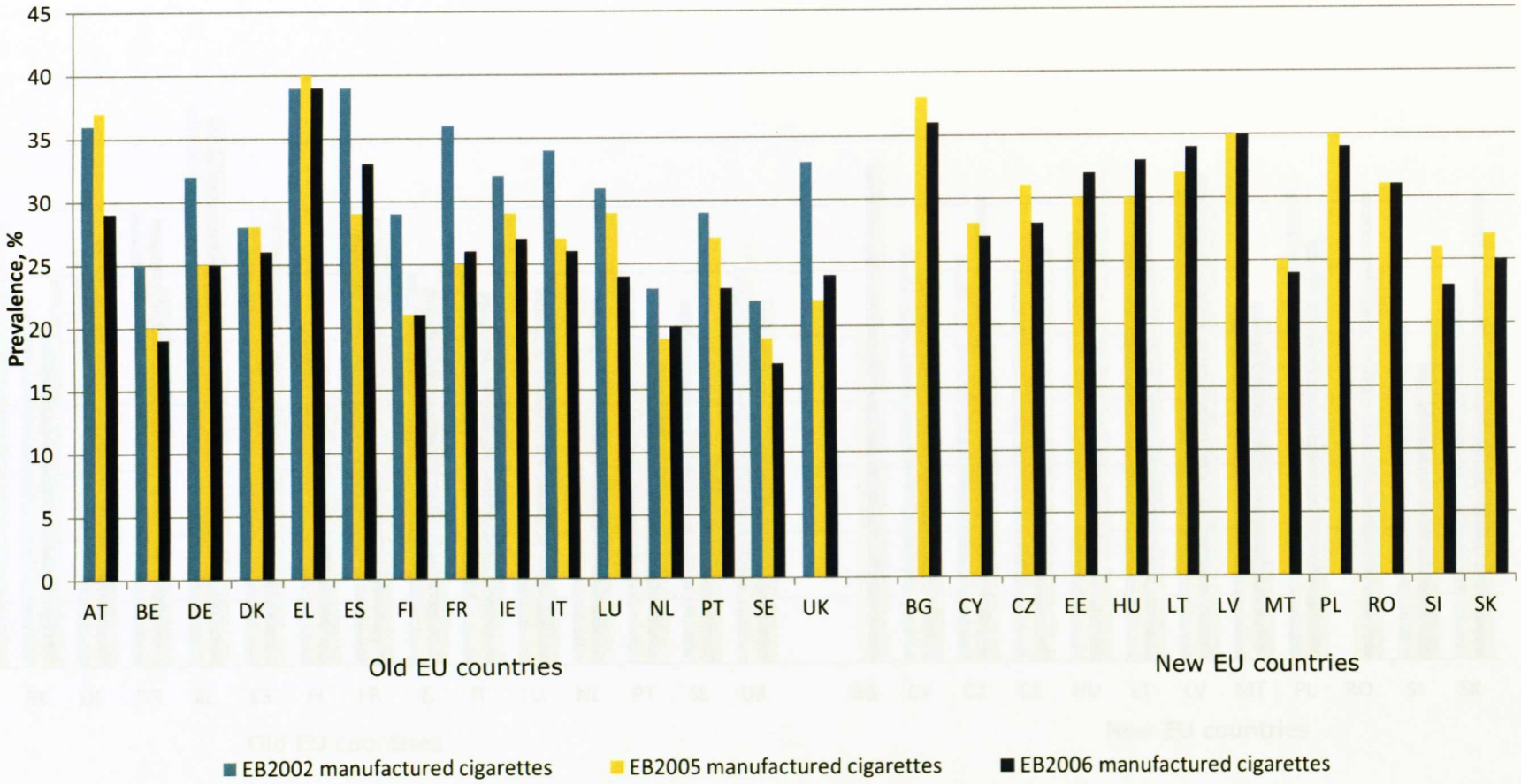

Figure 3.3: Prevalence of overall smoking manufactured cigarettes in EU countries (EB- Eurobarometer)

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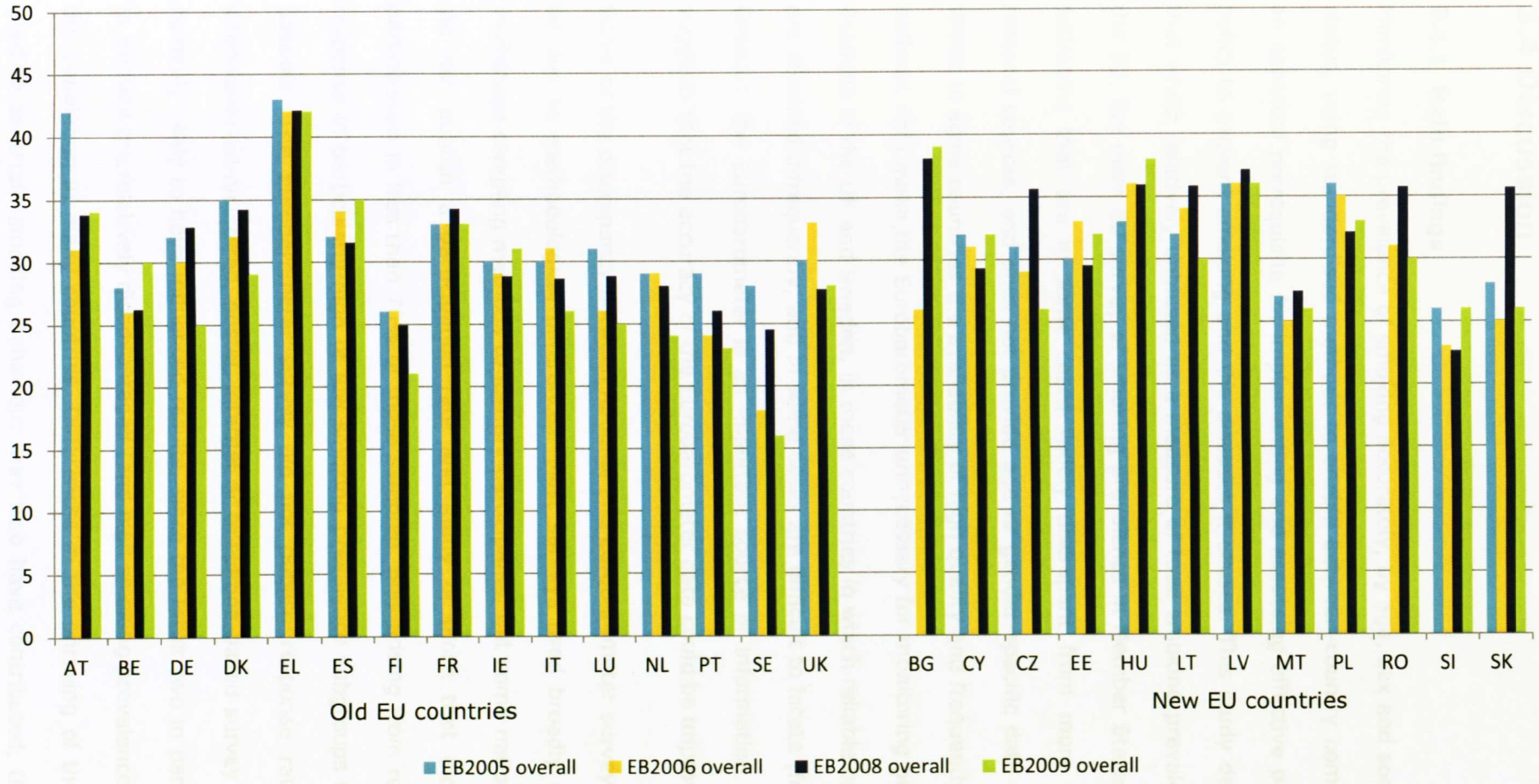


Figure 3.4: Prevalence of smoking across the EU Member Stats 2005-2009, Eurobarometer data

3.4 Discussion

3.4.1 Main findings

Monitoring the prevalence of smoking accurately, by age, sex and socioeconomic status, using standardised methods to enable between-country comparisons, is an essential prerequisite for implementing and assessing effective public health policy to prevent smoking and the diseases it causes. This study demonstrates that whilst relatively unbiased as a measure of total smoking prevalence across the EU, the main EU survey of smoking prevalence in Member States generates estimates that are in some cases widely discrepant from more substantive national sources, and does not provide age or gender-specific data by country. Whilst in some countries the availability of high quality and frequently measured national data make the Eurobarometer unnecessary for monitoring purposes, for example in the UK and Sweden, in those countries in which reliable national data are obtained infrequently, and in some cases are difficult to locate (for example, Greece), the Eurobarometer is an important source of information. This study suggests that the accuracy of the Eurobarometer data could be improved.

Some of the discrepancy between national and Eurobarometer survey results will be due to methodological differences. Most surveys used broadly comparable multistage sampling methods to identify participants, but some national surveys did not publish a participation rate and many of those that did, achieved participation in less than 70% of those sampled. Bias arising from relative non-response in particularly high or low smoking prevalence subgroups is therefore possible. The Eurobarometer survey did not publish response rates. Use of interviewer-administered, postal, internet or telephone-based survey methods is certainly likely to have influenced results, since the latter two in particular tend to exclude the relatively disadvantaged (and high smoking prevalence) sectors of the population in many countries. Differences in the phrasing of the questions used to ascertain smoking behaviour may also have contributed, though most

countries used a consistent approach in measuring all smoking (including cigars and pipes) on a daily or occasional (non-daily) basis. Since about 5% of people describe themselves as occasional smokers, the distinction between regular and occasional needs to be clearly defined, and daily smoking is an obvious and simple distinction to draw. Exclusion of non-daily smoking from the overall prevalence figure, as for example in Austria, will lead to substantially lower prevalence estimates. Since the great majority of smokers in the EU are cigarette smokers, inclusion or exclusion of pipe and cigar smoking makes little difference to the figures, but nevertheless results in slightly higher overall prevalence estimates if included, and should therefore be measured.

Since smoking rates vary markedly with age[29,284,285], differences in the age range surveyed are also potentially important. Smoking in the very young and the very old tends to be relatively uncommon, so inclusion of individuals in these age ranges will tend to reduce prevalence estimates. Many countries set no upper age limit on participation but many excluded those aged over 64, and in two cases, those over 59. At the lower age limit, most countries included those aged 15 and over, but Bulgaria and Greece excluded people aged under 25. Since smoking is typically common in young adults in the 20-24 age group, this may have resulted in an underestimate of total prevalence in these two countries.

Sample sizes were all higher, and in most cases substantially higher, in national than in the Eurobarometer surveys. With unbiased sampling and participation, the lower sample sizes in the Eurobarometer study should not result in systematic error in the overall prevalence estimates, but will increase random error and precludes a detailed breakdown of smoking by gender, age, or socioeconomic status within countries. Unfortunately, given the relatively small numbers of prevalence estimates available, it was not possible to estimate the independent effect of these various factors in this analysis.

Further evidence of the inaccuracy of individual country estimates are evident in the Eurobarometer figures for the UK, which since 2002 have varied between 28 and 45%[144,280,285,286], while national figures have fallen from 26 to 21%[284]. UK national survey data indicate that only about 1% of the population smokes cigars and pipes[284], so the discrepancy between these figures is not due to inclusion of other types of tobacco in the Eurobarometer estimates.

When trends over time were investigated in individual countries, only in a few EU significant trends were identified. For manufactured cigarette smoking the only two countries for which a significant decrease was observed between 2002 and 2006 were Luxembourg and Portugal, and for overall smoking, a decrease between 2005 and 2009 was observed in Poland and an increase in Bulgaria.

3.4.2 Comparison with previous research

There is no previous research investigating the validity of smoking prevalence estimates from various sources in the EU. It has been argued that measures of self- reported smoking prevalence tend to underestimate true tobacco smoking rates, and that use of biological markers would provide more accurate information about person's exposure to tobacco smoke[335]. However, none of the studies included in analysis provided any objective verification of smoking status.

It is estimated that smoking prevalence figures using weighted data are approximately 1% higher compared to unweighted smoking prevalence figures[336]. It is possible that differences in the probability sampling methods used, and the weighting of responses in the analysis of survey results impacted on these differences between national and Eurobarometer estimates, but few studies provided details of these procedures and therefore it was not possible to explore these effects any further.

3.4.3 Strengths and limitations

This is the first study comparing prevalence estimates from different sources for all current 27 EU Member States including a comparison of survey methods.

For some countries complete information from an original survey was not available, and secondary data sources were therefore used. However for a few countries some survey details were incomplete, for example the response rate was missing in Greece, Bulgaria, Luxembourg, the Netherlands, and Slovakia. In some cases use of translation was necessary which might have affected the accuracy of some survey details (questions asked, sampling methods) that were presented in Table 3.1 although attempts were made to verify this information.

The most important limitation of this study is use of smoking prevalence estimates from studies which had used different methods of measurements and done so at different time. Differences in timing between national and Eurobarometer studies may also have contributed to the discrepancies in prevalence estimates, though no evidence of systematic bias in this respect was found.

Currently available data from the Eurobarometer do not provide sufficient information of investigation of trends in smoking over a long time period as data are available for a few recent years only, and methods used for the 2008 survey were slightly different from other surveys. Given the limitations in the methodology of the Eurobarometer survey described earlier in this discussion, the trend analysis must be viewed with some caution.

3.4.4 Conclusions

Overall this study indicates that the measurement and monitoring of trends in smoking prevalence in EU countries both at national and EU levels is

inconsistent, unstandardised and in many cases infrequent. Harmonisation of methodology, or at least the inclusion of a basic set of common questions, would therefore be a major step towards the generation of data suitable to compare smoking prevalence in the EU countries over place and time. Whilst it may not be possible to use identical sampling methods in all countries, the approaches used in national surveys should be broadly consistent, using standardised age ranges, and data on participation rates are needed to determine how representative the participants are of the target population. At present, the Eurobarometer survey provides estimates generated from standardised methods, so comparisons of prevalence between countries using Eurobarometer data may therefore be more valid than comparisons between prevalence estimates from national surveys. However these advantages are offset by the disadvantages arising from the low sample sizes. On the other hand, national surveys tend to provide reasonable sample sizes but relatively little common ground in terms of smoking definitions. Less than half of all EU countries measure smoking prevalence on an annual or biennial basis.

A standardised approach to measuring smoking prevalence would use similar questions in all countries, and to allow for differences in the types of tobacco smoked, ask about smoking of all tobacco products. Since most countries currently use daily smoking as a definition of regular as opposed to occasional smoking, all countries should be encouraged to adopt questions that ascertain daily and occasional smoking of any tobacco products, and of manufactured or hand-rolled cigarettes. This would allow a direct comparison of prevalence between national surveys, at least within the minimum common age range. Ideally the surveys should include all aged 15 and over. Sample sizes need to be adequate to detect differences in prevalence between sexes, age- and socioeconomic groups, so that trends in uptake and cessation can be identified within them; in practice, this will probably require samples of 2000 to 4000[278].

Probability sampling methods and weighting also need to be harmonised as closely as possible, in case these also contribute to bias between national and transnational estimates. National surveys should ideally be repeated at least every two years to adequately monitor changes in smoking prevalence over time, though a case could be made for much more frequent monitoring. However, it is acknowledged that this survey strategy will not always be possible due to financial or other reasons.

All of these recommendations also apply to the Eurobarometer study which, in the absence of reliable or frequent data from some countries is the only available indicator of smoking prevalence and prevalence trends in some areas of Europe. Since monitoring smoking is such a health priority it is important that the Eurobarometer continues to provide directly comparable data broken down at least by age and gender, using a core set of questions to provide comparable responses to most national studies and on a regular basis. Surveys such as the WHO STEPS survey on cardiovascular risk factors could be used as an example for standardising methods for the Eurobarometer survey and national surveys. This survey has a comprehensive description of methodology and instructions for planning, setting up the survey and collecting and analysing data including a section on tobacco use with questions on current smoking status and quantities smoked, smoking uptake, quitting smoking and use of smokeless tobacco[337]. For the time being however, measurement of smoking prevalence in Europe is inadequate in many respects, and needs to be reformed.

Although there are a number of limitations for the Eurobarometer study, currently it is the best available source for smoking prevalence data for pan-European comparisons and therefore was adopted for further analysis in the thesis.

Chapter 4 Youth smoking prevalence in European Union countries

4.1 Introduction

As described in chapter 3, the prevalence of smoking among adults in EU Member States varies substantially; in some cases, national and Eurobarometer prevalence estimates show marked discrepancies; few EU Member States monitor adult smoking prevalence on an annual basis; and some do so very rarely. Although the lower age range included in national surveys varies, the majority use a minimum of 15 or 16 years and provide little detail of trends within younger age groups. Since smoking uptake among young people is an important determinant of ill health and of future adult smoking prevalence, it is also important to understand how youth smoking varies across the EU, both between Member States, and over time.

Youth smoking estimates are available for the EU from two international surveys: the European School Survey Project on Alcohol and Other Drugs (ESPAD) and the Health Behaviour in School-aged Children survey (HBSC). The WHO's Global Youth Tobacco Survey, which also investigates tobacco use among young people, includes some but not all EU countries[338] therefore cannot be used for pan-European comparisons. The purpose of this chapter is to explore and compare the data from both international sources, and to describe the differences between EU Member States and trends over time that they reveal. Although efforts were made to obtain national data on youth smoking prevalence, analysis of trends using national data was not conducted as such data were available for a few EU countries only.

4.2 Methods

Data sources for this study were identified as follows:

4.2.1 The European School Survey Project on Alcohol and Other Drugs (ESPAD)

Survey design

The main aim of the ESPAD project is to collect comparable data on substance use (alcohol, tobacco and drugs) among young people in European countries including countries outside the EU[339]. The number of countries involved varied between the years. In 1995 16 EU countries participated in the survey, in 1999- 22 countries and in 2003 and 2007- 26 out 27 current EU countries (data for Luxembourg were not available) (Table 4.1). Nationally representative samples are drawn as cluster samples, in which the sample units are school classes, and the net sample (returned questionnaires) is required to include answers from at least 2,400 students. Survey data are collected every four years, and at the time of writing published data were available for 1995, 1999, 2003 and 2007, with data from the 2011 survey not available at the time of writing[340-343]. The survey included students who were turning 16 in the year in which the survey is conducted, so the final sample for each country included those aged 15 and 16, with an average age of approximately 15.8 years[339].

Table 4.1: Countries participating in each of the studies

Survey	Year	Countries included	Countries excluded
ESPAD	1995	CY, CZ, DK, EE, FI, EL, HU, IE, IT, LV, LT, MT, PL, PT, SK, SI, SE , UK [18 total]	AT, BE, BG, FR, DE, LU, NL, RO, ES [9 total]
	1999	BG, CY, CZ, DK, EE, FI, FR, EL, HU, IE, IT, LV, LT, MT, NL, PL, PT, RO, SK, SI, SE, UK [22 total]	AT, BE, DE, LU, ES [5 total]
	2003	AT, BE, BG, CY, CZ, DK, EE, FI, FR, DE, EL, HU, IE, IT, LV, LT, MT, NL, PL, PT, RO, SK, SI, ES, SE, UK [26 total]	LU
	2007	AT, BE, BG, CY, CZ, DK, EE, FI, FR, DE, EL, HU, IE, IT, LV, LT, MT, NL, PL, PT, RO, SK, SI, ES, SE, UK [26 total]	LU
HBSC	1993/1994	AT, BE, CZ, DK, EE, FI, FR, DE, HU, LV, LT, PL, ES, SK, SE, UK [16 total]	BG, CY, EL, IE, IT, LU, MT, NL, PT, RO, SI [11 total]
	1997/1998	AT, BE, CZ, DK, EE, FI, FR, DE, EL, HU, IE, LV, LT, PL, PT, SK, SE, UK [18 total]	BG, CY, IT, LU, MT,NL, RO, SI, ES [9 total]
	2001/2002	AT, BE, CZ, DK, EE, FI, FR, DE, EL, HU, IE, IT, LV, LT, MT, NL, PL, PT, ES,SI, SE, UK [22 total]	BG, CY, RO, SK, LU [5 total]
	2005/2006	AT, BE, BG, CZ, DK, EE, FI, FR, DE, EL, HU, IE, IT, LV, LT, MT, NL, PL, PT, RO, SI, SK, ES, SE, UK [26 total]	CY

Smoking prevalence estimates

Prevalence data are provided for boys and girls both separately and combined, and include details on experimentation with smoking (*On how many occasions (if any) during your lifetime have you smoked cigarettes?*) and smoking within last 30 days by number of cigarettes smoked (*How frequently have you smoked during the last 30 days? Not at all/ Less than one cigarette per week/ less than one cigarette per day/ 1-5 cigarettes per day, 6-10 cigarettes per day, 11-20*

cigarettes per day or more than 20 cigarettes per day)[340]. In the present analysis, data have been used for all students who reported smoking (all except those reporting not having smoked (0 cigarettes- further referred as 'not at all') within last 30 days. Since rounding errors sometimes resulted in the sum of the proportions of smokers and non-smokers exceeding 100%, the proportion of smokers was calculated by subtracting proportion of non-smokers from 100 (instead of summing proportion for individual categories for the number of cigarettes smoked; as the proportion of non-smokers consists of a single estimate and is less likely to be affected by rounding and therefore can be regarded as more accurate). For comparison with the other major European study (HBSC, see below), the prevalence of daily smoking was estimated by adding categories that included at least one cigarette a day (1-5, 6-10, 11-20 or 21+ cigarettes a day).

4.2.2 The Health Behaviour of School Aged Children (HBSC)

Survey design

The HBSC survey is a cross-national research study conducted in collaboration with the WHO Regional Office for Europe. The HBSC survey is carried out every four years and data from published reports are currently available online for the four latest surveys for the years 1993/1994, 1997/1998, 2001/2002 and 2005/2006. The target population includes age groups- 11 years, 13 years and 15 years. The survey is carried out using nationally representative samples of approximately 1500 people in each age group. Although smoking prevalence in 11 and 13 year olds is of interest, these age groups were excluded from the analysis in this study as only 15 year-olds, who are included in both surveys, could be used for the comparisons. As for the ESPAD survey, the number of EU countries involved in each of the survey waves varies: in 1993/1994 16 out of

current 27 EU countries participated; in 1997/1998- 17 EU countries; in 2001/2002- 22 and in 2005/2006- 26 EU countries (the UK counting as one country although regional data were provided) (Table 4.1). In 2001/2002 the survey was also carried out in Slovakia, but data were not included in the international data file and were not published because the sample size was too small. The only EU Member State which did not participate in any of the survey waves was Cyprus.

Smoking prevalence estimates

The proportion of students who have experimented with smoking (*Have you ever smoked tobacco (at least one cigarette, cigar or pipe)? Yes, No),* smoking initiation *(When (if ever) did you first do each of the following things- smoke your first cigarette, smoke cigarettes on a daily basis?)* and frequency of smoking (*How often do you smoke tobacco at present? I don't smoke, Every day, At least once a week, but not every day, Less than once a week*) is presented separately for girls and boys for each age group but pooled results are not available in the published sources[344-348]. For this study data on the proportion of those smoking once a week or more were analysed (these data are subsequently referred to as current smoking). Also, daily smoking prevalence estimates for 15 year-olds were used for comparisons with the ESPAD survey, however these data were available in published sources for the three latter survey waves only.

Within the HBSC survey, data for the UK were provided separately for regions (England, Scotland, Wales, Northern Ireland), and since inclusion of regions varied over time, a weighted average was estimated. Weighting was done using published data on population size in the respective years[349,350].

For Belgium, data for all waves of the HBSC survey, except 1997/1998, were provided for Flemish and French regions separately, and for 1997/1998 only Flemish region data were published. Therefore weighted average prevalence estimates were calculated where possible using published population estimates[351]. As overall population estimates were not available from the published source for the years 1994 and 2002 these were substituted with the closest available year (1995 for 1993/1994 survey and 2000 for 2001/2002 survey). For France and Germany data for selected regions only were available for all years.

4.2.3 Changes in smoking prevalence

For each country a trend over time was investigated using linear regression. As number of countries involved in each survey differed, trends were investigated for individual countries but not across the EU. Countries with two data points only and those where a break in data was observed between data points were excluded from this analysis of trends as these were likely to produce inaccurate trend estimates due to missing data. Additionally, changes observed between the first (1995 for ESPAD and 1993/1994 for HBSC) and the last currently available (2007 for ESPAD and 2005/2006 for HBSC) survey waves for ESPAD and HBSC were investigated (latter survey estimates were subtracted from the estimates obtained in the earlier survey). This analysis was restricted to countries where prevalence estimates for both data points were available even if data were missing for one survey in between (however these were excluded from analysis of trends).

4.2.4 Comparisons of daily smoking prevalence

To investigate whether smoking prevalence estimates differ between ESPAD and HBSC surveys, daily smoking prevalence figures were compared. A comparison estimating the difference between both surveys was done for 15 year old boys and girls. For ESPAD survey daily smoking prevalence was calculated by adding categories that included at least one cigarette a day (1-5, 6-10, 11-20 or 21+ cigarettes a day). For HBSC survey prevalence figures for daily smoking were provided in the published report.

4.2.5 Statistical analysis

Trends over time for both surveys for boys and girls were investigated using linear regression. When the relationship between the ESPAD survey data which referred to 30 days smoking and HBSC data which referred to current smoking was investigated, Spearman rank correlation was used. An agreement between daily smoking prevalence figures obtained from both surveys was estimated using Bland-Altman plots. For data analysis SPSS v.17 was used.

4.3 Results

4.3.1 ESPAD survey

Mean smoking prevalence and countries at the extremes for each year are listed in Table 4.2. Overall it would appear that in boys smoking prevalence has decreased in last two surveys compared to earlier ones while it appears that smoking prevalence in girls tends to increase in later surveys. However, changes over time in prevalence of smoking among boys and girls differ between countries. However, it must be noted that a number of countries involved in each survey wave differed.

Table 4.2: Summary of smoking prevalence estimates (15 year olds, ESPAD data)

Year	Prevalence	Mean (SD)	Lowest value (country)	Highest value (country)
1995	Boys	31.8 (6.0)	19.0 (SI)	39.0 (LV)
	Girls	28.4 (8.4)	15.0 (CY)	45.0 (IE)
	Overall	29.7 (5.9)	19.0 (SI)	41.0 (IE)
1999	Boys	36.7 (7.2)	25.0 (CY)	49.0 (LT)
	Girls	24.6 (9.4)	9.0 (CY)	51.0 (BG)
	Overall	35.5 (7.1)	16.0 (CY)	50.0 (BG)
2003	Boys	34.4 (7.8)	20.0 (SE)	49.0 (LT)
	Girls	34.8 (8.2)	18.0 (CY)	56.0 (AT)
	Overall	34.4 (6.9)	23.0 (SE)	49.0 (AT)
2007	Boys	28.9 (7.1)	17.0 (UK)	44.0 (LV)
	Girls	30.4 (8.3)	17.0 (CY)	48.0 (AT)
	Overall	29.7 (7.3)	19.0 (PT)	45.0 (AT)

In Figure 4.1. all countries are presented including data for all years for which ESPAD data were available.

Figure 4.1: Smoking prevalence within the last 30-days in 15 year-old boys and girls, ESPAD data, 1995-2007 (produced using published data)

When trends over time were investigated in individual countries Austria, Belgium, Germany, and Spain were excluded from the regression analysis as they had only two data points only. The only significant trends were decreasing trends for boys and girls in Ireland (b=-1.45; 95% CI -2.27; -0.63 and b=-1.48; 95% CI -2.69; -0.26, respectively; beta coefficients presented refer to the decrease in smoking prevalence between surveys) and the UK (b=-1.28; 95% CI -2.5; -0.06 and b=-1.20; 95% CI -2.32; -0.08, respectively), boys only in Malta (b=-0.55; 95% CI -1.0; -0.09), and girls only in Sweden (b=-0.83; 95% CI -1.53; -0.12). An increasing trend for girls in Latvia (b=1.03; 95% CI 0.02; 2.02) was also identified (Figure 4.1). However, in many cases prevalence estimates followed a U-shaped pattern.

Changes in smoking prevalence (ESPAD data)

Between 1995 and 2007 in the 18 countries for which data were available on both occasions, in boys the mean smoking prevalence decreased by 3.3 percentage points (ranging from 18 percentage points decrease in Ireland to 9 percentage points increase in Slovenia, Figure 4.2), and increased in girls by an average of 0.7 percentage points (SD 10.1; ranging from an 18 percentage point decrease in Ireland to an 18 percentage point increase in Slovakia, Figure 4.2).

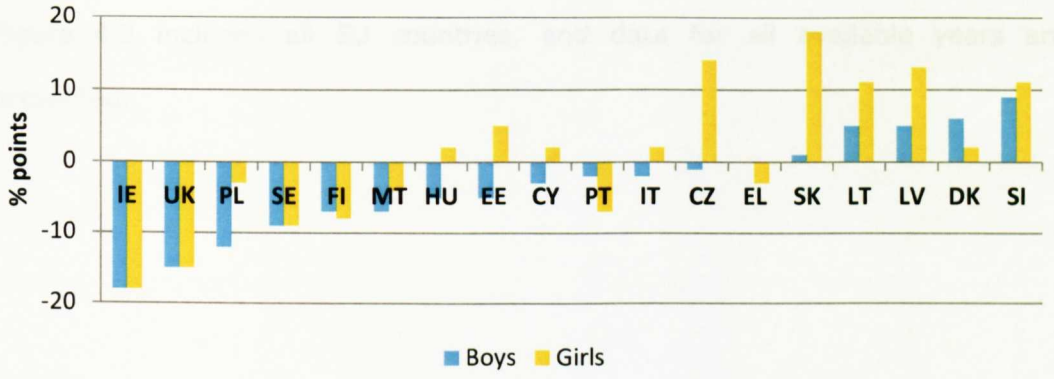


Figure 4.2: Changes in smoking prevalence in boys and girls between 1995 and 2007 (ESPAD data, ranked by changes in smoking prevalence among boys)

4.3.2 HBSC survey

Average prevalence of current smoking in 15 year-olds, and the countries at the extremes of the range of estimates for all survey years, are presented in Table 4.3. While for girls average prevalence of smoking appears to have decreased in the most recent survey only, boys smoking prevalence appears to be lower in the last two surveys compared to the first two. However, the number of countries involved in each of the survey waves differed.

Table 4.3: Summary of current smoking prevalence (15 year-olds, HBSC data)

Year	Prevalence	Mean (SD)	Lowest value (country)	Highest value (country)
1993/1994	Boys	22.1 (5.8)	14.0 (DK)	33.0 (LV)
	Girls	18.7 (8.8)	4.0 (LT)	31.0 (AT)
1997/1998	Boys	25.6 (5.2)	18.0 (SE; EL)	37.0 (LV)
	Girls	23.6 (7.4)	10.0 (LT)	36.0 (AT)
2001/2002	Boys	23.9 (6.2)	11.0 (SE)	35.0 (LT)
	Girls	24.6 (6.2)	14.0 (EL)	37.0 (AT)
2005/2006	Boys	19.0 (5.2)	9.0 (PT; SE)	30.0 (LV)
	Girls	19.4 (5.6)	8.0 (SE)	36.0 (BG)

Figure 4.3 includes all EU countries, and data for all available years are presented.

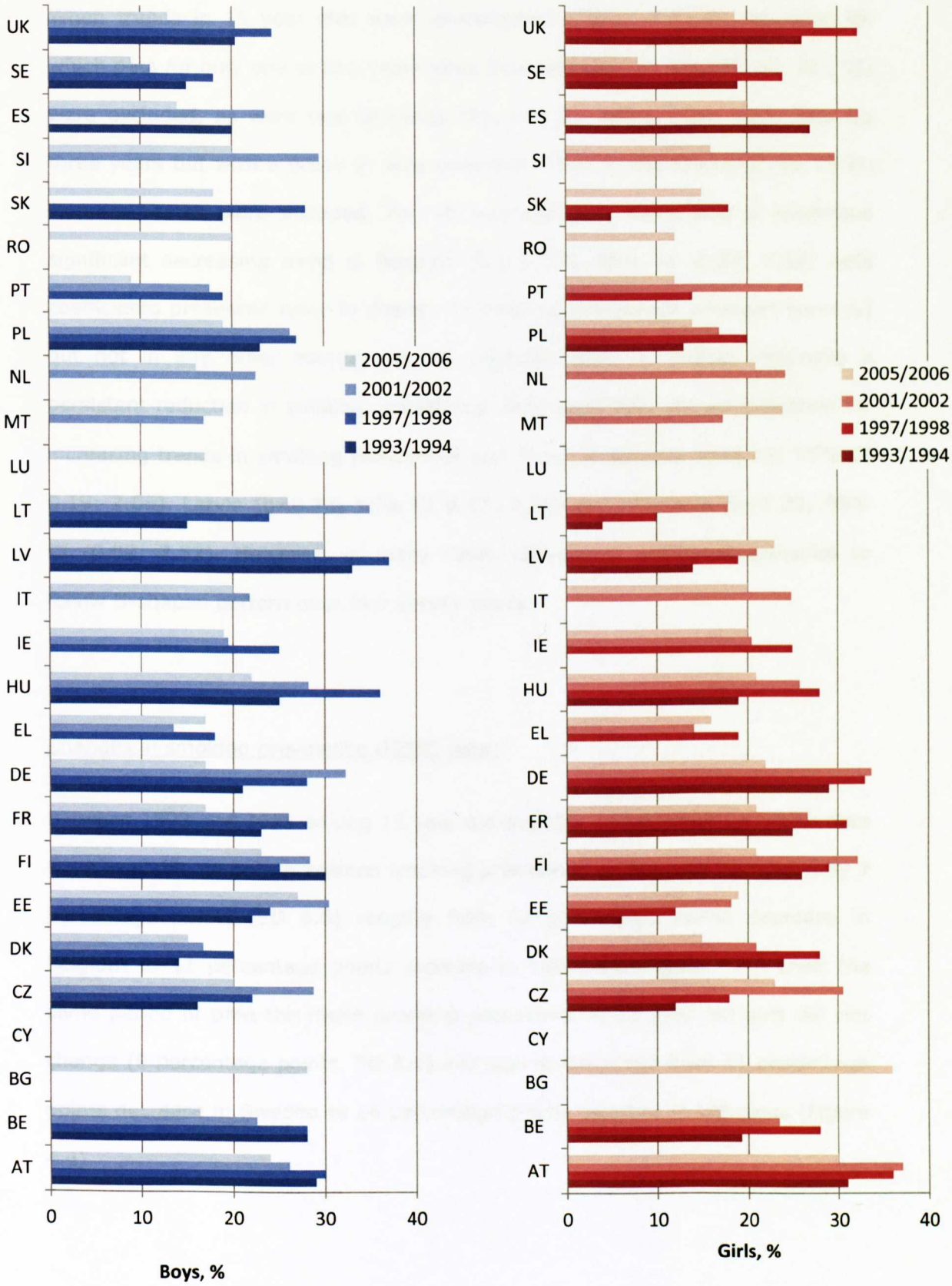


Figure 4.3: Current smoking prevalence (once a week or more) in 15 year old boys and girls, HBSC data, 1993-2005 (figure produced using published data).

When trends in 15 year olds were investigated (Figure 4.3) EU countries for which data for only one or two years were available (BG, IT, LU, MT, NL, RO, SI) were excluded, as were two countries (ES, SK) for which there were data for three years but with a break in data collection. Thus in the final analysis 16 EU Member States were included. For 15 year-old boys there was a borderline significant decreasing trend in Belgium (b=-1.025; 95% CI -2.24; 0.19; beta coefficients presented refer to change in smoking prevalence between surveys) but not in any other country. In 15 year-old girls, no trends indicating a persistent reduction in smoking prevalence were identified, but an indication for increasing trends in smoking prevalence was found in Estonia (b=1.13; 95% CI 0.19; 2.06), Latvia (b=0.73; 95% CI 0.17; 1.28) and Lithuania (b=1.25; 95% CI -0.02; 2.52). However, in many cases prevalence estimates appeared to follow U-shaped pattern over four survey years.

Changes in smoking prevalence (HBSC data)

Between 1993 and 2005 among 15 year old boys for 16 countries for which data were available on both occasions smoking prevalence on average decreased by 3 percentage points (SD 5.6) ranging from 12 percentage points decrease in Belgium to 11 percentage points increase in Lithuania (Figure 4.4). Over the same period of time the mean smoking prevalence in 15 year old girls did not change (0 percentage points, SD 8.4) and was in the range from 11 percentage points decrease in Sweden to 14 percentage points increase in Lithuania (Figure 4.4).

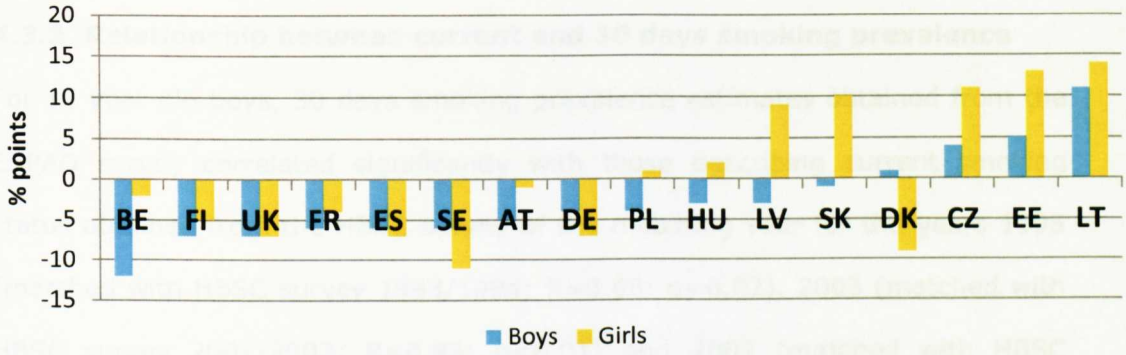


Figure 4.4: Change in smoking prevalence among 15 year-old boys and girls between 1993/1994 and 2005/2006 (HBSC data, ranked by changes in boys smoking prevalence)

4.3.3 Relationship between current and 30 days smoking prevalence

For 15 year-old boys, 30 days smoking prevalence estimates obtained from the ESPAD survey correlated significantly with those describing current smoking status obtained from the HBSC survey of the matching year for the years 1995 (matched with HBSC survey 1993/1994; R=0.68; p=0.02), 2003 (matched with HBSC survey 2001/2002; R=0.88; p<0.01) and 2007 (matched with HBSC survey 2005/2006; R=0.72; p<0.01), and the correlation for 1999 was borderline significant (matched with HBSC survey 1997/1998; R=0.48; p=0.07). For 15 year-old girls, smoking prevalence from the ESPAD survey correlated significantly with estimates from the matched HBSC survey (as indicated for boys) for all years (1995 R=0.95; p<0.01; 1999 R=0.65; p<0.01; 2003 R=0.77; p<0.01 and 2007 R=0.68; p<0.01).

4.3.4 Daily smoking comparisons

Boys

In the 1998/9 comparison, countries for which data were available in ESPAD survey differed from those included in HBSC survey (Table 4.1.); there were 15 countries for which data were available from both surveys and hence could be included in further analysis. These were the Czech Republic, Denmark, Estonia, Finland, France, Greece, Hungary, Ireland, Latvia, Lithuania, Poland, Portugal, Slovakia, Sweden and the UK. The mean daily smoking prevalence in 15 year-old boys in the ESPAD survey for these 15 countries was 27.1% (SD 7.3) ranging from 13% in Sweden to 41% in Lithuania. For the corresponding HBSC survey (1997/1998) average daily smoking prevalence was 18.4% (SD 5.2) and ranged from 10% in Sweden to 29% in Hungary (Figure 4.5).

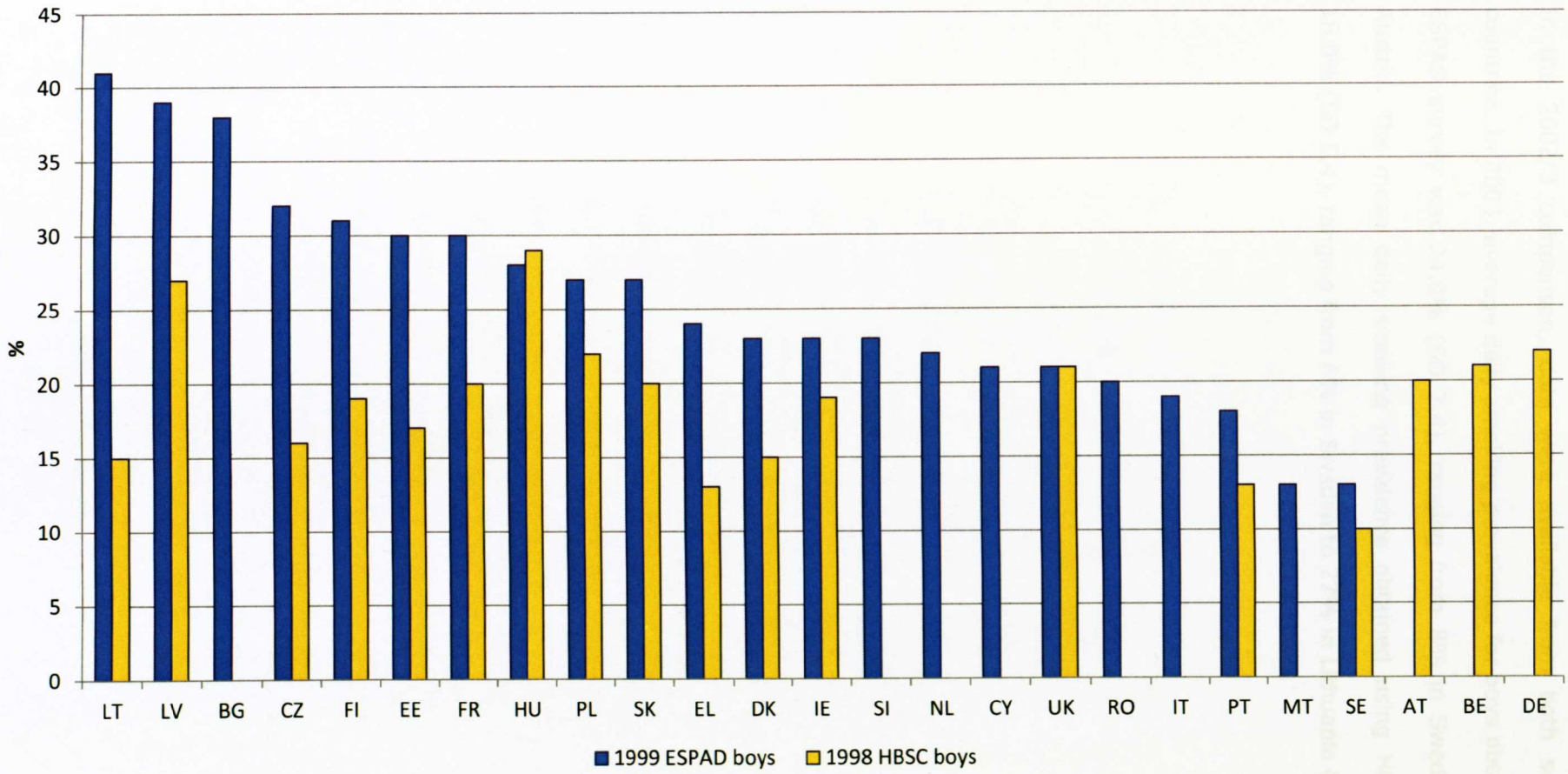


Figure 4.5: Daily smoking prevalence in 15 year-old boys, ESPAD (1999) and HBSC survey data (1997/1998) (ranked by ESPAD survey; produced using published data)

In the 2002/3 comparison, data were available from both surveys for 22 countries. In 2003, average daily smoking prevalence for boys obtained from the ESPAD survey was 24.0% (SD 7.4), ranging from 8% in Sweden to 37% in Austria. The mean daily smoking prevalence obtained using HBSC data was 18.0% (SD 5.4), ranging from 6% in Sweden to 27% in Lithuania (Figure 4.6).

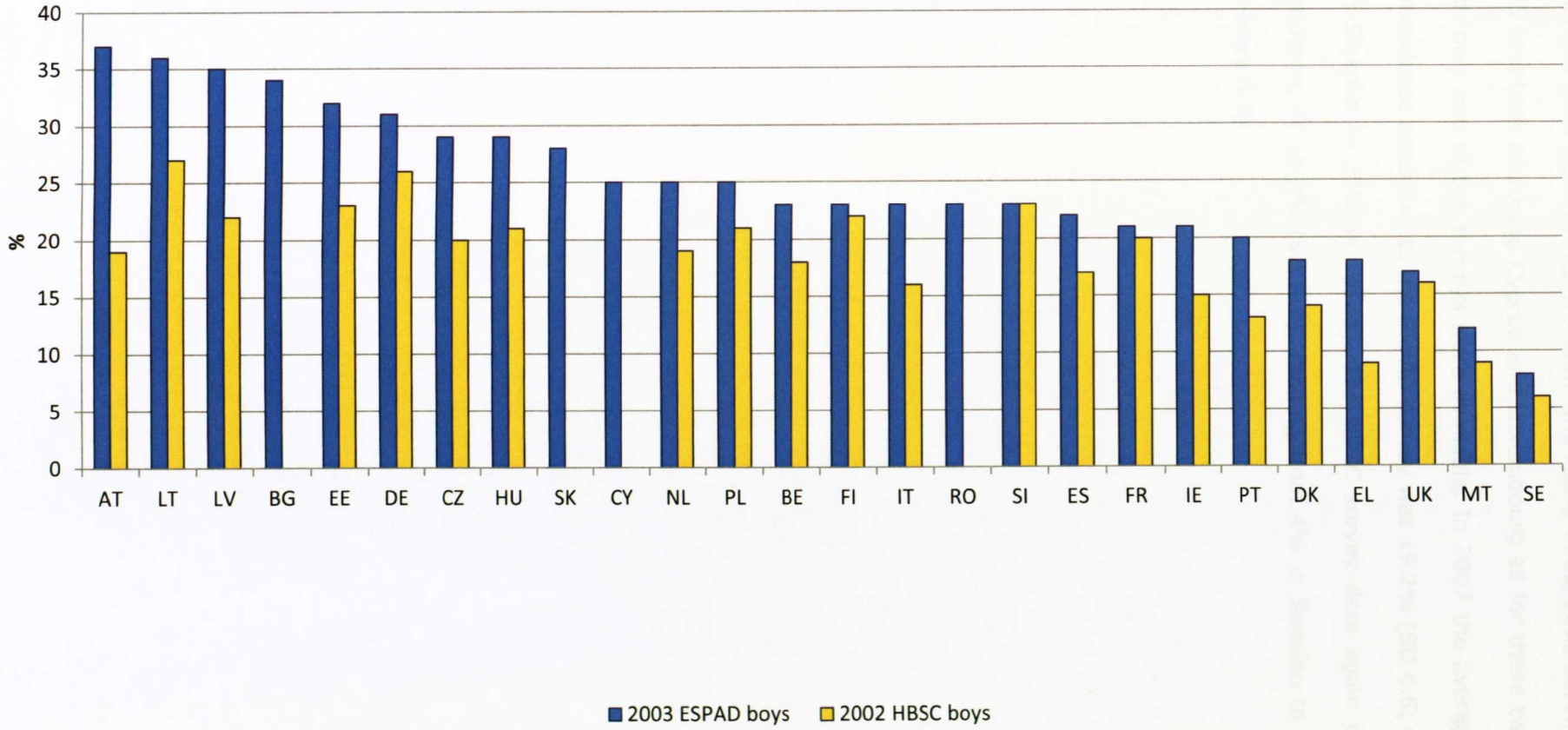


Figure 4.6: Daily smoking prevalence in 15 year-old boys, ESPAD (2003) and HBSC survey data (2001/2002) (ranked by ESPAD data; produced using published data)

Comparisons between ESPAD 2007 and HBSC 2005/2006 surveys were done for 25 countries excluding Cyprus and Luxembourg as for these two countries data for only one of the surveys were available. In 2007 the average daily smoking prevalence according to the ESPAD survey was 19.2% (SD 6.6; ranging from 8% in Sweden to 33% in Latvia). The HBSC survey data again provided a lower estimate, of 14.2% (SD 4.9), ranging from 4% in Sweden to 23% in Bulgaria (Figure 4.7).

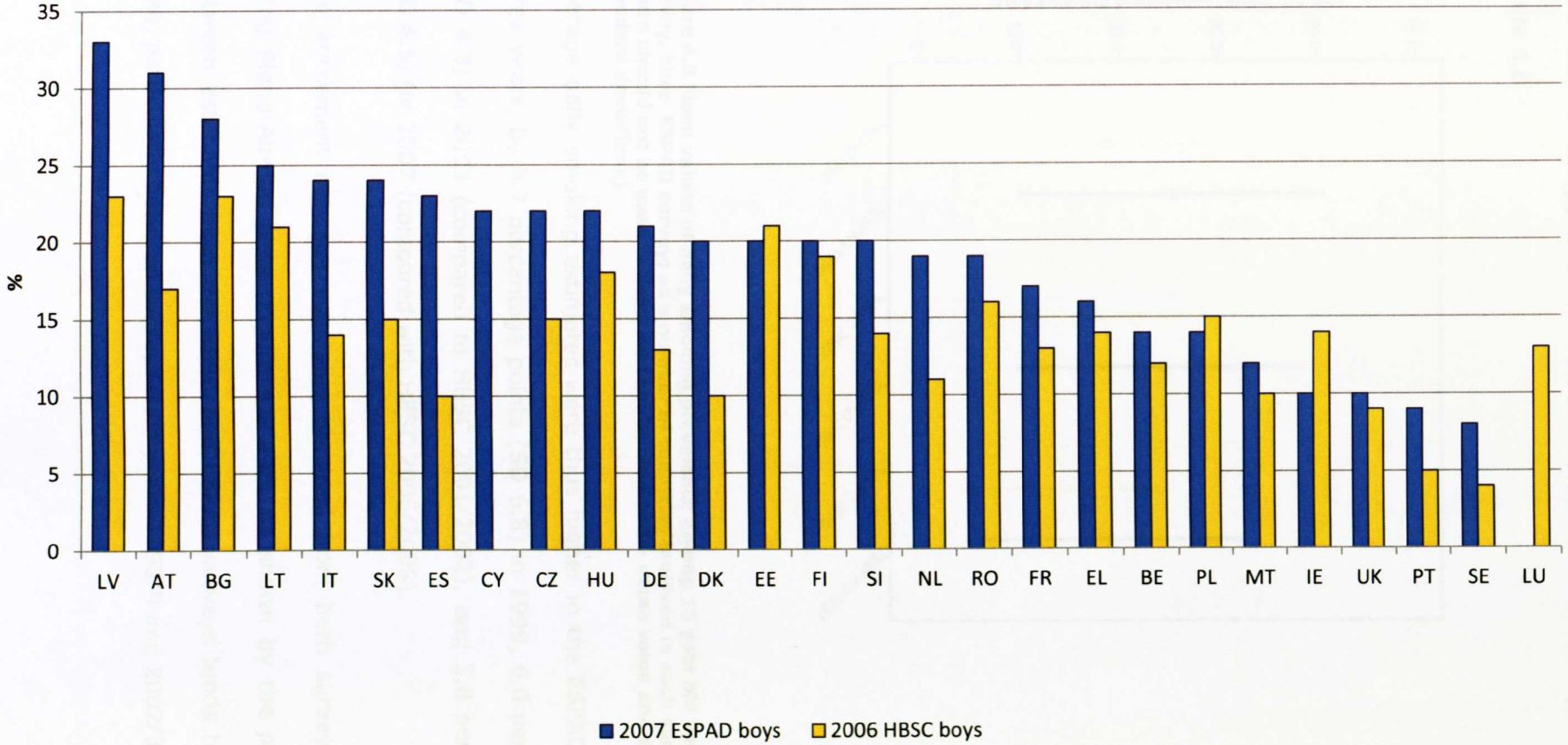


Figure 4.7: Daily smoking prevalence in 15 year-old boys, ESPAD (2007) and HBSC survey data (2005/2006) (ranked by ESPAD survey; produced using published data)

Mean daily smoking prevalence values for boys for both surveys are presented in Figure 4.8.

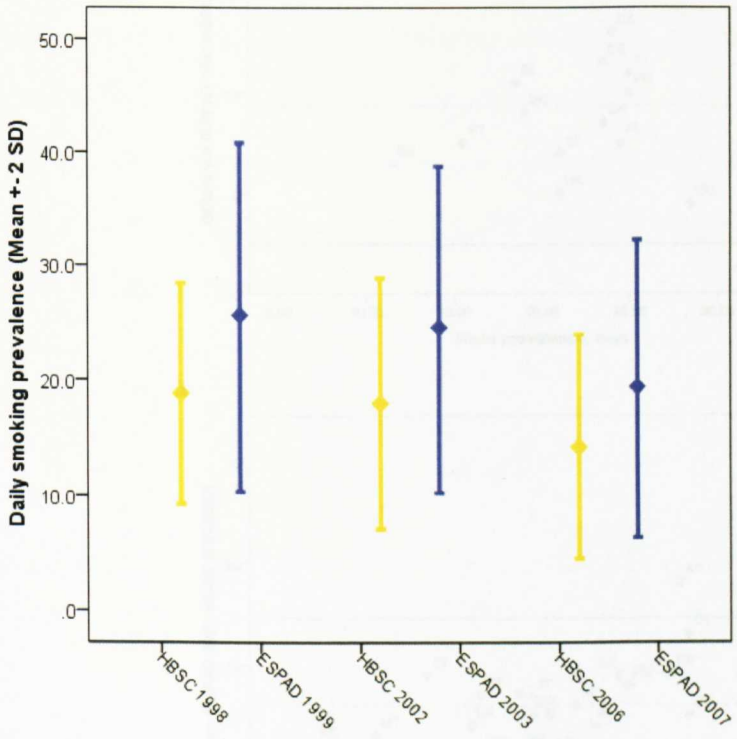
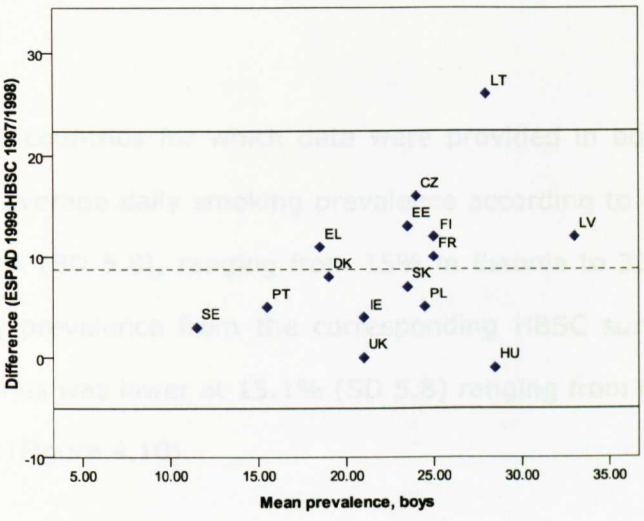


Figure 4.8 Mean values of daily smoking prevalence among 15 year old boys (yellow- HBSC survey, blue- ESPAD survey; as a number of countries involved in each survey differs this figure should not be used to describe trends; diamonds- mean value and error bars- two standard deviations)

Average daily smoking estimates were thus higher in the ESPAD survey for all three years, by 8.7 percentage points (SD 6.8) in 1999, 6.0 percentage points (SD 4.3) in 2003 (compared to HBSC 2001/2002), and 5.0 percentage points (SD 4.5) for 2007 (compared with HBSC 2005/2006).

The agreement between estimates obtained from both surveys is illustrated using Bland-Altman plots (Figure 4.9 a-c). As shown by the plots agreement between estimates from the HBSC and ESPAD surveys tends to improve with time, particularly between surveys from years 1998/9 and 2002/3.



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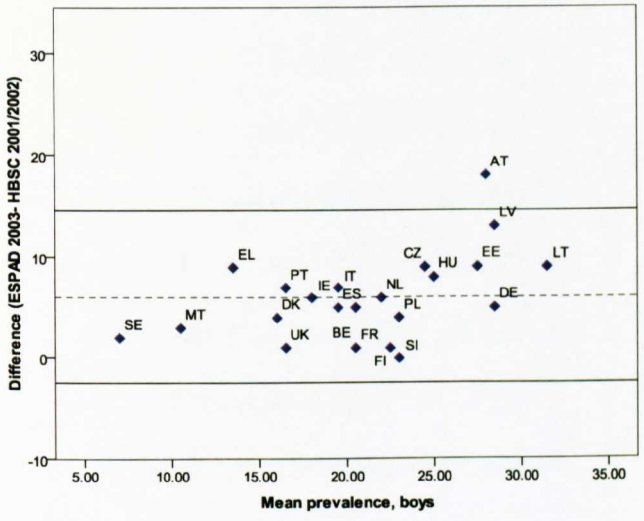

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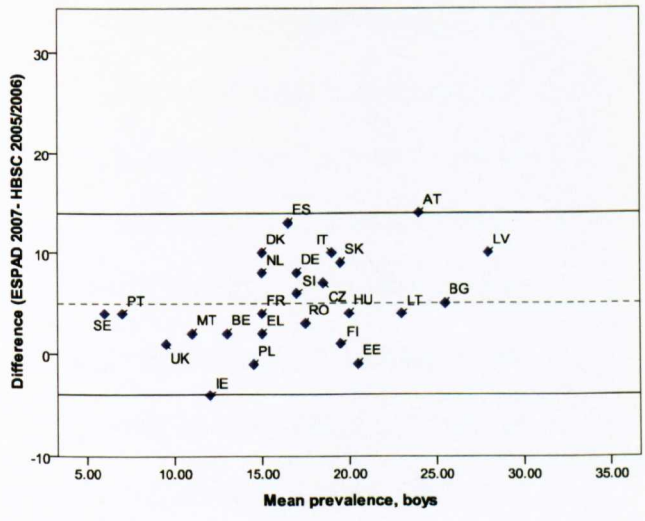

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Figure 4.9: Bland-Altman plots measuring agreement between daily prevalence estimates for boys

Girls

In 1999 for 15 countries for which data were provided in both surveys for 15 year-old girls, average daily smoking prevalence according to the ESPAD survey data was 22.4% (SD 5.8), ranging from 15% in Estonia to 33% in France. The mean smoking prevalence from the corresponding HBSC survey for the same group of countries was lower at 15.1% (SD 5.8) ranging from 6% in Lithuania to 25% in France (Figure 4.10).

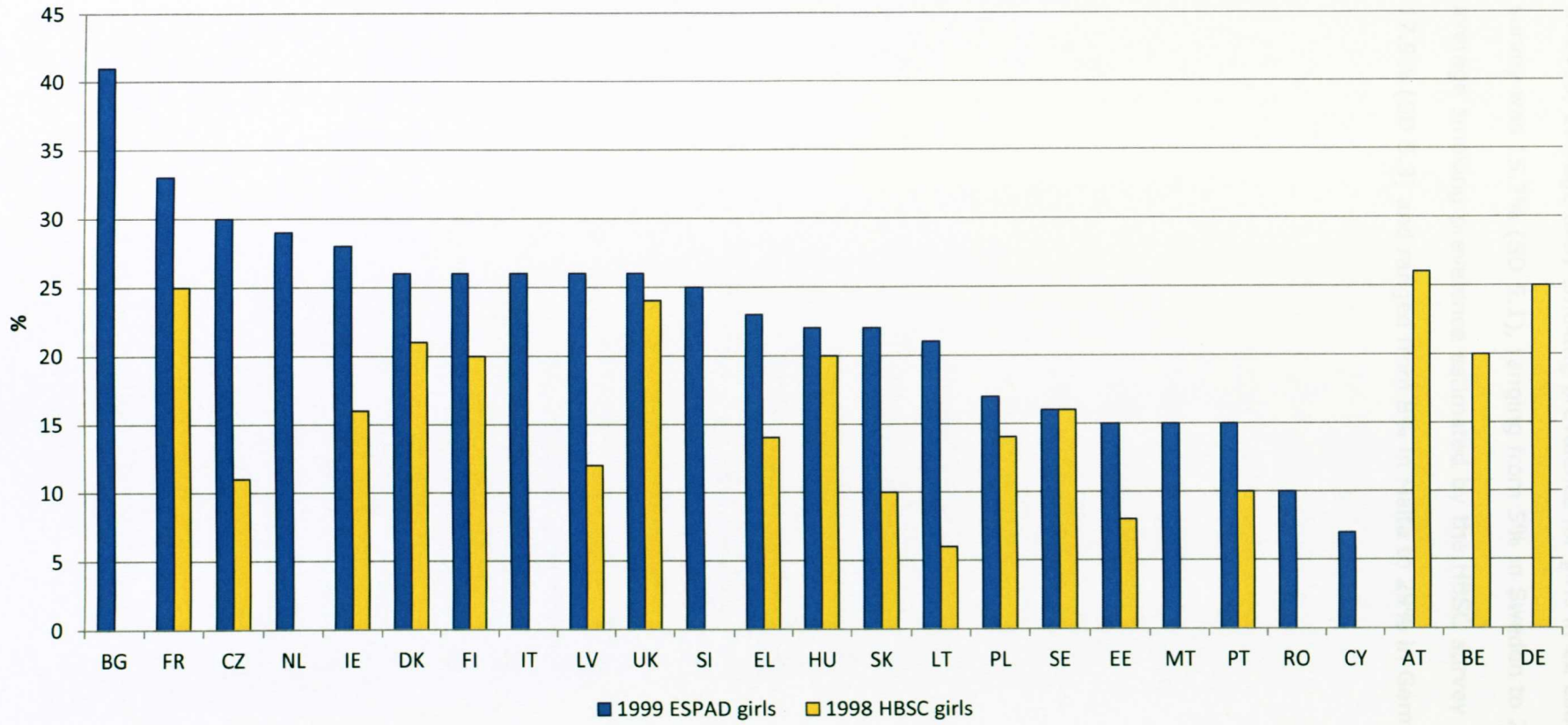


Figure 4.10: Daily smoking prevalence in 15 year-old girls, ESPAD (1999) and HBSC survey data (1997/1998) (ranked by ESPAD data; produced using published data)

In 2003, average daily smoking prevalence for girls in 22 countries in the ESPAD survey was 15.7% (SD 5.1), ranging from 5% in Sweden to 28% in Austria. The average smoking prevalence estimated by the HBSC survey data was higher at 17.9% (SD 5.3) and ranged from 8% in Malta to 29% in Germany (Figure 4.11).

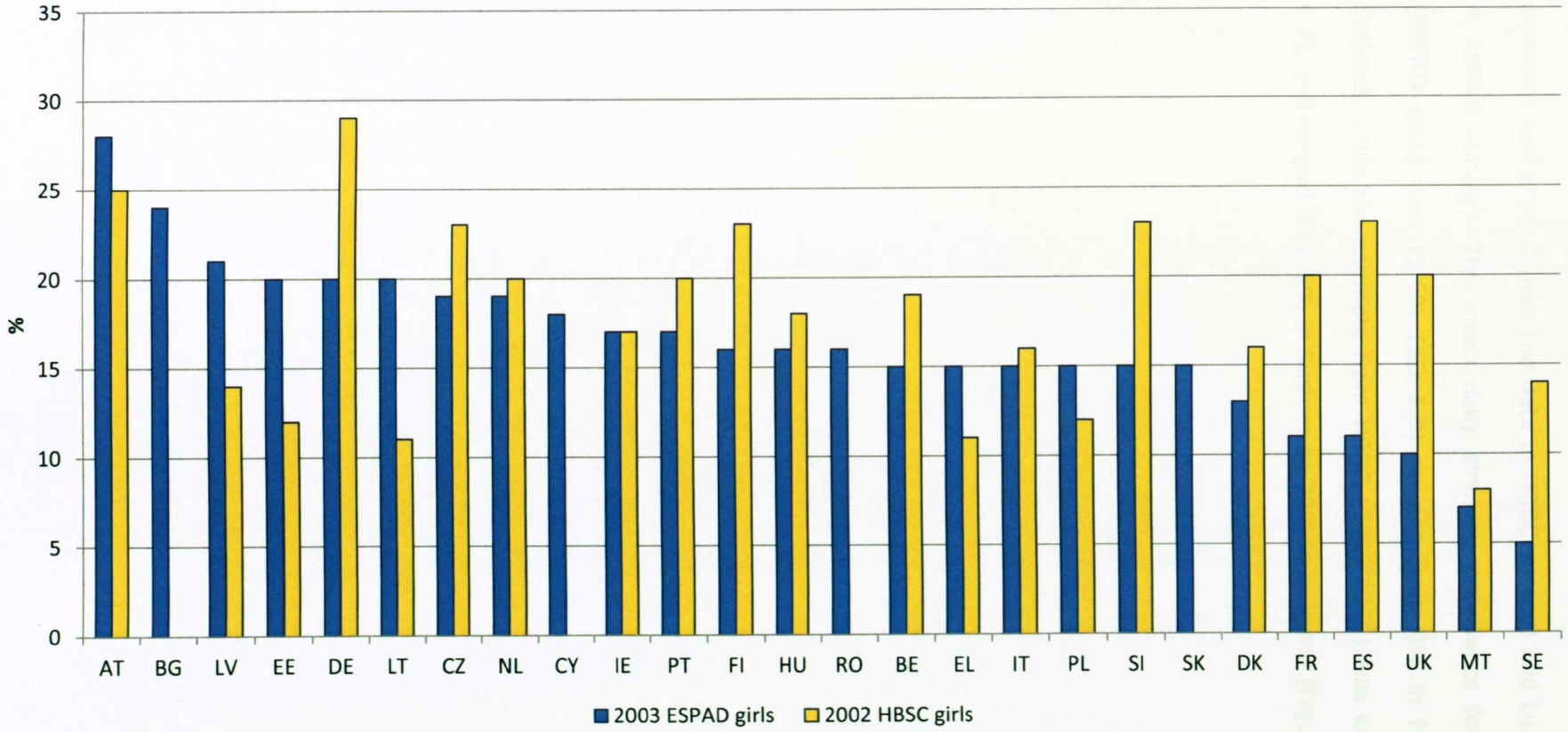


Figure 4.11: Daily smoking prevalence in 15 year-old girls, ESPAD (2003) and HBSC survey data (2001/2002) (ranked by ESPAD data; produced using published sources)

A comparison between ESPAD 2007 and HBSC 2005/2006 data was done for 25 countries excluding Cyprus (no data in HBSC survey) and Luxembourg (no data in ESPAD survey). The mean daily smoking prevalence for 15 year-old girls (ESPAD data) was 19.6% (SD 6.9) ranging from 8% in Portugal to 35% in Bulgaria, while the estimate from HBSC (2005/2006) was lower at 13.9% (SD 4.7), and ranged from 6% in Sweden to 29% in Bulgaria (Figure 4.12).

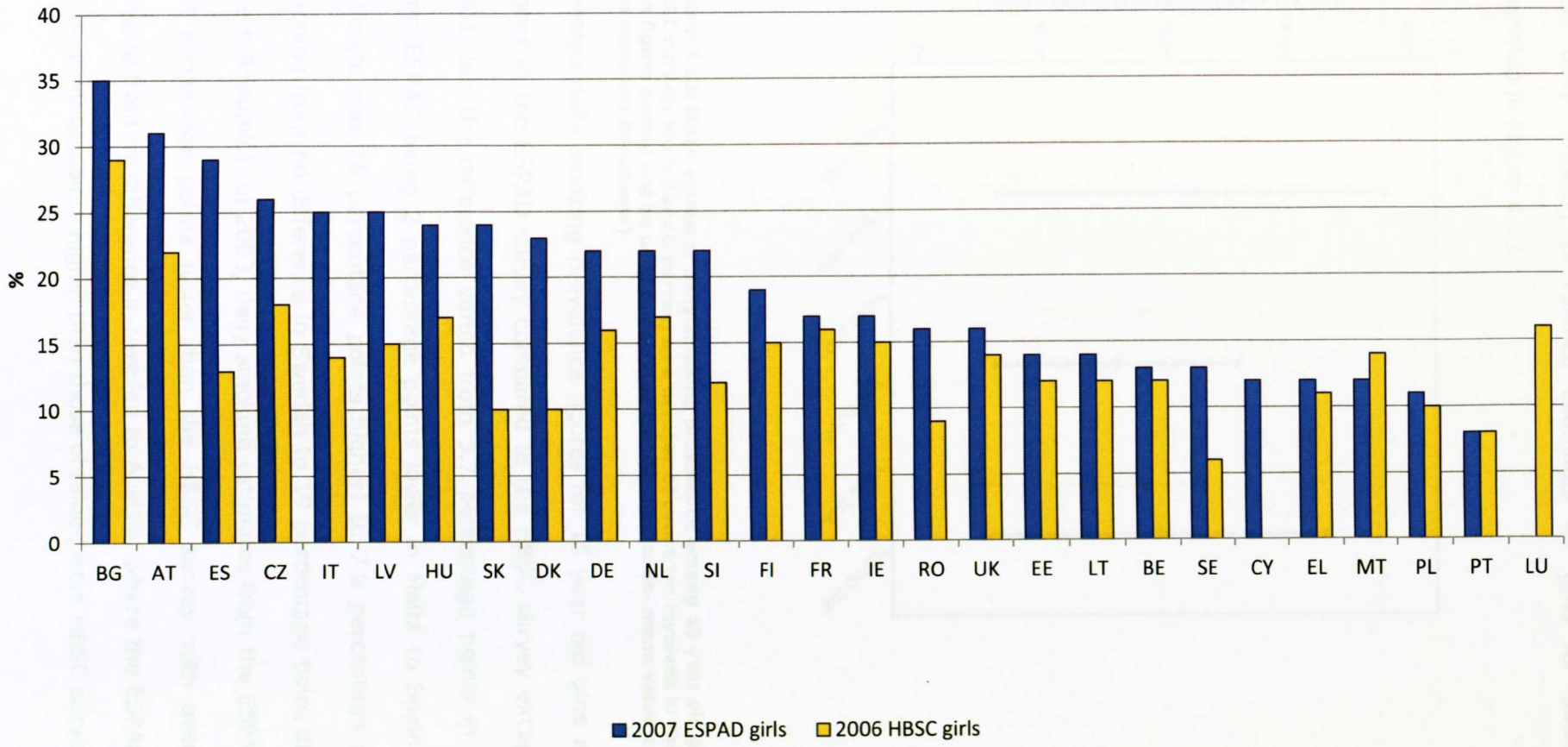


Figure 4.12: Daily smoking prevalence in 15 year-old girls, ESPAD (2007) and HBSC survey data (2005/2006) (ranked by ESPAD survey; produced using published data)

Mean daily smoking prevalence estimates for girls for both surveys are presented in Figure 4.13.

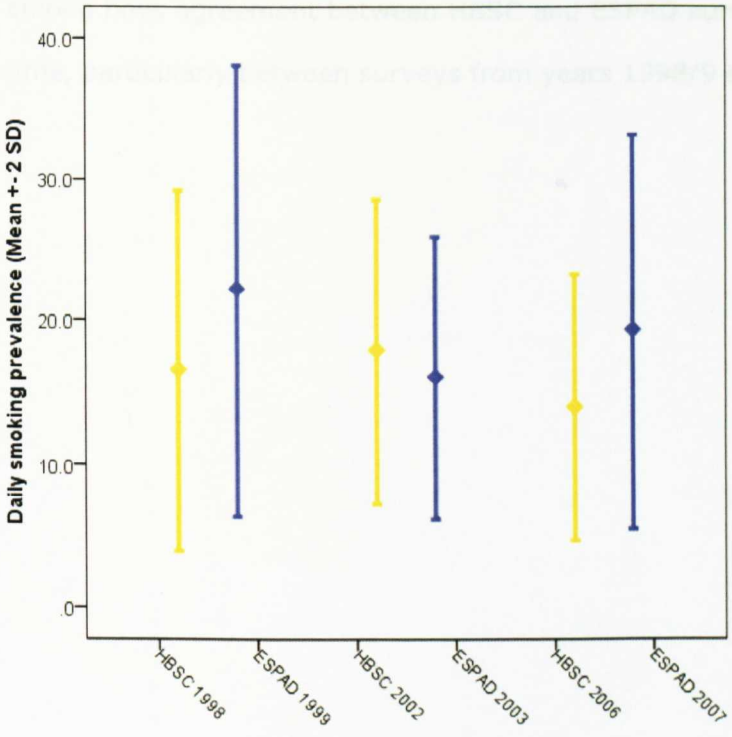
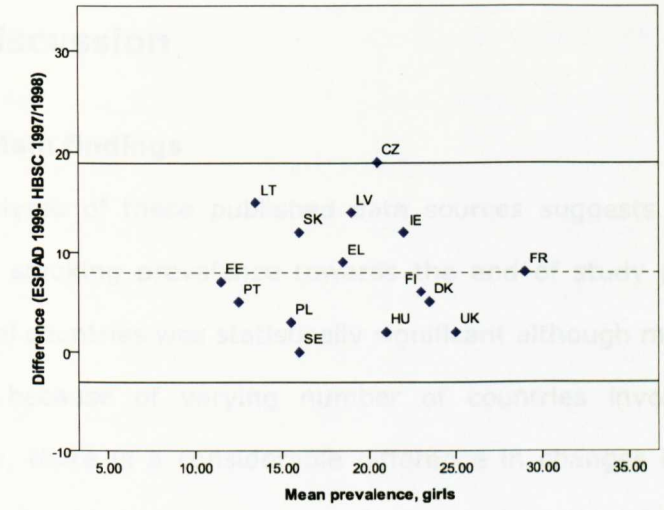


Figure 4.13: Mean values of daily smoking prevalence among 15 year old girls (yellow- HBSC survey; blue- ESPAD survey; as a number of countries involved in each survey differs this figure should not be used to describe trends; diamonds- mean value and error bars- two standard deviations)

Average daily smoking prevalence figures for 15 year old girls appeared to be higher in the ESPAD survey compared to the HBSC survey except for the year 2003, but the difference varied from 5.7 percentage points in 2007 (ranging from ESPAD being 2 percentage points lower in Malta to Spain where ESPAD estimate was 16 percentage points higher) to 7.9 percentage points in 1999 (ranging from no difference in Sweden to 19 percentage point difference in the Czech Republic). In 2003, daily smoking estimates from the ESPAD survey were 2.2 percentage points lower than the HBSC survey with average estimates ranging from no difference in Sweden to Austria, where the ESPAD estimate was 16 percentage points higher than those obtained from HBSC survey.

The agreement between estimates obtained from both surveys is illustrated using Bland-Altman plots (Figure 4.14 a-c), and similarly to smoking prevalence among boys agreement between HBSC and ESPAD surveys tend to improve over time, particularly between surveys from years 1998/9 and 2002/3.



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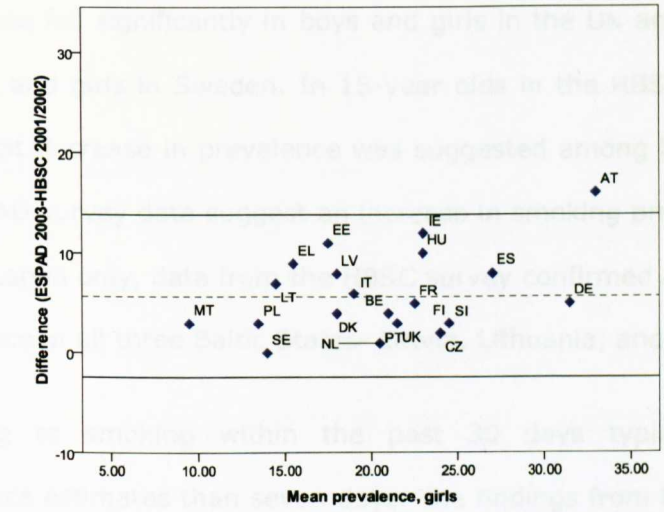

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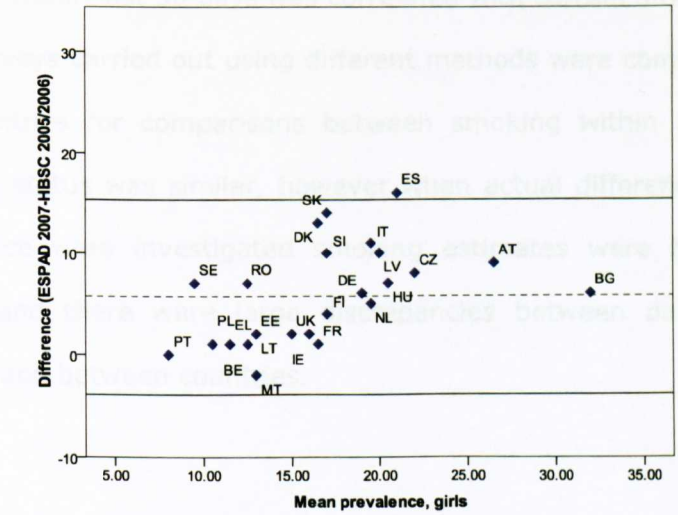

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Figure 4.14: Bland-Altman plots measuring agreement between daily prevalence estimates for girls

4.4 Discussion

4.4.1 Main findings

The analyses of these published data sources suggests a decreasing trend in average smoking prevalence towards the end of study period, which in some individual countries was statistically significant although must be interpreted with caution because of varying number of countries involved in the datasets. However, there is a considerable difference in changes in smoking prevalence between boys and girls. Among 15 year-olds in the ESPAD survey, smoking prevalence fell significantly in boys and girls in the UK and Ireland, and in boys in Malta and girls in Sweden. In 15-year olds in the HBSC survey, a borderline significant decrease in prevalence was suggested among boys in Belgium. While the ESPAD survey data suggest an increase in smoking prevalence in 15 year old girls in Latvia only, data from the HBSC survey confirmed an increase in smoking prevalence in all three Baltic States- Latvia, Lithuania, and Estonia.

Referring to smoking within the past 30 days typically produces higher prevalence estimates than seven days. The findings from this study suggest that smoking within last 30 days was correlated with current smoking when data from both surveys carried out using different methods were compared. The ranking of the countries for comparisons between smoking within 30 days and current smoking status was similar, however when actual differences for daily smoking prevalence were investigated smoking estimates were higher in the ESPAD survey and there were large discrepancies between data provided by both surveys and between countries.

4.4.2 Comparison with previous research

There is a large variation in smoking prevalence among young people, however according to the findings from the Global Youth Tobacco Survey in the European

region (includes WHO Europe not merely EU countries) smoking prevalence in 13-15 year olds is one of the highest compared to other regions across the world[352]. The results from this study confirm that smoking is still an important public health issue, and in some countries youth smoking prevalence is still increasing. The findings from this study are in line with findings on change in adult smoking prevalence from Eurobarometer studies, confirming that across the EU some countries have experienced large decreases in smoking prevalence, while in a few EU Member States smoking prevalence has increased over the recent years[24].

4.4.3 Strengths and limitations

This is the first study investigating smoking prevalence and trends among young people using comparisons of two different surveys across the current EU Member States. Each of the surveys uses relatively large national sample sizes and consistent methodology over time, producing comparable data within each survey.

Methods used in the two surveys differed, including the reference period when asking about smoking (30 days in ESPAD survey vs. current smoking in HBSC survey). Using seven days recall can provide a description of consumption in more detail while 30 days cigarette smoking history is reported to be more accurate measurement for occasional smoking[279]. Occasional smoking is more common among adolescents, which might explain why ESPAD survey figures appeared to be consistently higher than those from the HBSC survey as those who are occasional smokers might not report that they are currently smoking (referring to last seven days). Questions asked to measure daily smoking prevalence differed, however efforts were made to match these questions as closely as possible to produce comparable estimates.

The surveys used for this study are carried out every four years and therefore proper investigation of trends is difficult as not enough data points are available. In the last two decades EU countries have implemented more tobacco control policies, so more frequent data are required to accurately evaluate impact of tobacco control policies and changes over time. Also, many countries did not participate in all or at least three surveys, in which case trends could not be investigated, and limited the number of countries for which relations between estimates from two surveys were calculated. Typically, data were not available for the EU Member States that have joined EU in recent years, many of which are also at an earlier stage of the tobacco epidemic with higher smoking prevalence estimates. ESPAD and HBSC surveys are carried out in different years and therefore comparisons with the same year were not possible, instead comparisons were made with the closest year of data from the second survey; however it is not likely that major changes in prevalence would occur within one year. For some countries regional data are collected. Attempts were made to obtain representative smoking prevalence estimates where possible using weighted average values, but in Germany and France this was not possible as only selected regions participated in the surveys. For the UK, data from the first survey (1993/1994) excluded England, the largest UK jurisdiction, so figures might not be representative of the UK. For the latter two surveys the only region not included was Northern Ireland, but because the population of Northern Ireland constitutes only about 3% of overall UK population[349] this exclusion is unlikely to have significantly affected prevalence estimates. In this study linear trends over time were investigated; however it is possible that such trends can be observed only once a country has reached the peak in youth smoking prevalence and until then changes appear to follow a U-shape pattern. However, no evidence on when the peak in youth smoking prevalence has been reached in each country was available, therefore analysis was restricted to investigation of linear trends over four survey waves.

4.4.4 Conclusions

Generally, it appears that smoking prevalence among young people has slightly decreased over the last 15 years in the EU, with a more obvious decrease in recent years which was also the time when many EU countries implemented effective tobacco control policies. However, results on the extent and direction of change differ between the surveys used and between boys and girls. The pattern of the decrease varies between countries and between girls and boys, and in some countries smoking prevalence in girls is still increasing. There are important differences between data provided by the surveys which could possibly be related to methodological differences between these surveys. However, data of good quality suitable for international comparisons are scarce. Therefore in order to accurately explore changes in smoking in young people in more details using advanced statistical techniques it is necessary to investigate trends using more frequent national data in countries where such data are available.

Both surveys included questions on smoking as a part of larger studies on various health related topics. Results from these surveys cannot be combined due to methodologies applied and differences related to that. Although the ESPAD survey includes only those aged 15-16 years of age, it was identified as more suitable for international comparisons as sample sizes in this age group were larger and more countries were involved in earlier surveys compared to the HBSC survey. Therefore, for the future, it would be recommended that both surveys adopt the same set of questions as it would lead to comparable results.

Chapter 5 Smoking prevalence and perceived corruption in European Union Member States

5.1 Introduction

5.1.1 Tobacco control policies and smoking prevalence in the EU

As previously described, there is a marked variation in smoking prevalence and direction of change in prevalence across the current EU Member States. For example, smoking prevalence in Sweden is the lowest in the EU and is still falling, whilst in countries such as Greece, Austria and Bulgaria, prevalence is high and in some cases still rising[353].

Differences in current smoking prevalence between countries in part reflect inevitable differences in stage of progression of the smoking epidemic[19], but also reflect the extent to which past and current governments have implemented WHO Framework Convention on Tobacco Control policies[354] to prevent and reverse the progression of the smoking epidemic[19]. Since most of these policies were first advocated nearly fifty years ago[355,356], governments, politicians and public health specialists have long been aware that measures such as high taxation, advertising bans, smoke-free legislation and health warnings on cigarette packs are effective in preventing smoking[166]. However, adoption of such policies is a variable and predominantly recent phenomenon in most EU Member States, and remains far from comprehensive[274,357]. Effects of individual tobacco control policies and smoking prevalence have been discussed in detail in Chapter 1.

5.1.2 Obstacles for implementation of effective tobacco control policies

Failure to reduce smoking prevalence may arise either from failure to enact effective tobacco control policies, or from failure to ensure compliance with them. It has previously been reported that smoking prevalence reflects the extent to which effective tobacco control policies are implemented, and that

support for and the success of smoke-free policies is greater in the EU countries with more advanced tobacco control policies[358]. However, high smoking prevalence to a large extent reflects health policy failure.

5.1.3 Corruption and tobacco control

Transparency International defines corruption as the abuse of entrusted power for private gain[359]. Corruption is also explained as a manifestation of institutional weakness, poor ethical standards, skewed incentives and lack of proper enforcement[360]. Corruption is more likely to occur in countries with greater poverty and lower levels of income. Poverty itself increases susceptibility to corruption, besides it has impact on economic development. Due to limited resources for policy implementation and enforcement, being a poor country is likely to decrease likelihood of implementation of effective tobacco control measures. However, the association between corruption and tobacco control has not been explored.

5.1.4 The aim of the chapter

The first aim of this chapter was to explore the association between implementation of tobacco control policies and smoking prevalence. In this study it has been hypothesized that higher smoking prevalence would be expected in countries in which health policy is undermined by conflicting interests or cultures, and that in particular, tobacco control policies would be less likely to be implemented or enforced in countries with high levels of corruption. Therefore further aim of this chapter was to explore the association between public sector corruption and other national characteristics, and the prevalence of smoking in the current 27 EU Member States; to understand whether country characteristics

other than implementation of conventional tobacco control policies are related to smoking prevalence, and to attempt to explain variation in it.

5.2 Methods

Ecological associations between smoking prevalence in the 27 EU Member States and variables describing various national characteristics identified from existing evidence[361-364] and internet searches as measures that quantified country characteristics likely to influence smoking prevalence were investigated. Data sources identified and used were:

Smoking prevalence

Smoking prevalence data were taken from the Eurobarometer survey, which measures smoking prevalence in all current 27 EU Member States from samples of around 1,000 respondents (500 in smaller Member States) aged 15 years and older. Since the most recent available data for other country characteristics (below) were available for the years 2007 or 2008, 2008 Flash Eurobarometer data were used for the present analysis[365] (Flash Eurobarometer is a type of Eurobarometer survey which is conducted using telephone interviews, and allows results to be obtained quickly with a focus on specific target groups[366]). In this case national estimates were not analysed in the present study as such estimates were available for only a minority of EU Member States in any one year. For the purpose of investigating the relationship between national smoking prevalence estimates and Tobacco Control Scale (TCS) scores national data as presented in Chapter 3 were used, as national prevalence estimates were identified as more valid.

Tobacco Control Scale (TCS) scores

As described in Chapter 2 the TCS quantifies implementation of six different tobacco control policies in the EU. TCS scores for 2007 were used when relation

between smoking prevalence estimates from the Eurobarometer 2008 survey and national prevalence estimates for the year closest to 2006 was investigated.

Corruption

The *Transparency International* Corruption Perceptions Index data for 2008 were used. The Corruption Perceptions Index measures perceived levels of public sector corruption on a scale from 1 to 10, higher scores representing lower corruption[179]. It draws on 13 sources provided by 11 independent expert and business institutions which measure different aspects of corruption using strict criteria. The Corruption Perceptions Index is estimated using a two-step standardization process as the sources use different scales, to provide a mean value reflecting data from 2007 and 2008[367]. In a first step new sources are standardized using matching percentiles. The highest value in the master list (in this case year 2007 data) is taken as the standardized value for the country ranked best by the new source. All values are in the range between 1 and 10. In the second step beta transformations is used followed by calculation of average scores[367].

National wealth

National wealth was measured as *per capita* Gross Domestic Product (GDP), taking data in Euros from the Eurostat database for the year 2008 (except Romania, for which the most recent data were for 2007)[168].

Income inequality

The ratio of total equivalised disposable income, defined as total household income divided by its age-weighted equivalent size (to take into account the size and composition of household), in the highest relative to the lowest quintiles of income[368,369], from the Eurostat database for 2008 was used[370].

Material deprivation

Material deprivation was measured as the proportion of the population receiving an equivalised income below 60% of the median income, using 2008 data from the Eurostat database (data for the UK and France were provisional)[371].

Social budget

Data on national spending on social benefits (transfers in cash and in kind to households and individuals, other social protection spending and administration costs) in purchasing power standards (PPS) were obtained from the Eurostat database for 2007 (values for Germany, Spain, France, Italy, Cyprus, Latvia, Lithuania, the Netherlands, Slovenia, Slovakia, Sweden, UK were provisional)[372].

Life satisfaction

Life satisfaction is one of the measures for subjective well-being and indicates the degree to which the expectations and needs of the population are met. In this study life satisfaction was preferred over happiness as life satisfaction is a

more cognitive driven evaluation of one's life compared to happiness which is considered to be more of an evaluation of current emotional state[373].

For this study national average life satisfaction scores, measured on a scale from 1 to 10 from least to most satisfied, from the Second European Quality of Life Survey for 2007 were used[373].

Human Development

The Human Development index is a composite index of national human development which combines data on a long and healthy life, knowledge and education, and standard of living. Life expectancy at birth is used as an indicator for long and healthy lives while adult literacy along with gross enrolment ration (indication for enrolment in primary, secondary and tertiary education) represent knowledge and education. *Per capita* GDP in this case is used as an indicator for a decent standard of living. Data for 2007 published in the United Nations Development Programme Human Development Report were used[374].

Gender Equality

The Gender Empowerment Measure, a composite index of gender inequality in economic and political participation, and decision making and power over economic resources, was used provided for 26 Member States (Luxembourg unavailable) by the United Nations for 2006[374].

Unemployment

Data on the proportion of the labour force (age 15-74) unemployed in 2008 were obtained from the Eurostat database[375].

Education

Data on the proportion of the population aged 18-24 with at most lower secondary education (early school leavers) were taken from the Eurostat database for 2008[261].

Importance of religion

Data on the proportion of respondents in each country reporting that religion is among three of their most important personal values were obtained from the Standard Eurobarometer survey for 2008[376].

Tobacco production

Data on total quantity of raw tobacco delivered by Member States in the year 2008 were used provided by the European Commission Directorate General for Agriculture and Rural Development[23].

Proportion of ex-smokers

Data on the proportion of people who used to smoke but have stopped were included as a proxy indicator of the current stage of smoking epidemic[19]. Data for the year 2008 from the Flash Eurobarometer survey were used[365].

Relationships between smoking prevalence and country characteristics at multivariate level were explored separately for the EU countries that became Member States before 2004 (old EU countries- Belgium, Denmark, Germany, Ireland, Greece, Spain, France, Italy, Luxembourg, the Netherlands, Austria, Portugal, Finland, Sweden, the United Kingdom) and those that joined in 2004 and 2007 (new EU countries- Czech Republic, Estonia, Cyprus, Latvia, Lithuania, Hungary, Malta, Poland, Slovenia, Slovakia, Romania and Bulgaria).

Policy enactment and implementation

The extent of overall national tobacco control policy enactment in individual Member States was assessed using the Joossens and Raw Tobacco Control Scale (TCS) for 2007 (max 100), and as a specific example of implementation of a currently topical policy smoke-free policy TCS scores for smoke free work and other public places (maximum score 22) was used[357]. Scores for smoke free-policies were given separately for workplaces excluding cafes and restaurants (max 10 points), cafes and restaurants (max 8 points), and public transport and other public places (max 4 points). Enforcement of smoke-free policy was measured using 2008 Flash Eurobarometer survey[365] self-report estimates of the proportion of people exposed to tobacco smoke in the workplace among those working away from home (including any exposure time), and the proportion of indoor workers who do not have any smoking restrictions at their workplace. To verify consistency of the findings associations were investigated using 2009

Special Eurobarometer[144]. As questions regarding exposure to second hand smoking differs between Eurobarometer surveys, for comparisons with the 2009 Eurobarometer survey proportion of people exposed to tobacco smoke at workplaces was considered (from all respondents and not only those working away from home).

Statistical analysis

SPSS v.17 was used to estimate univariate Spearman Rank correlations, and partial correlation and multiple regression with backwards exclusion to identify associations with smoking prevalence that were independently significant at $p<0.05$. Stata v.11.0 was used to investigate multicollinearity (using variance inflation factor) and to perform additional modelling of the relationship between country characteristics and smoking prevalence. In this case variables that increased overall proportion of variance explained by the model (adjusted R^2) were included in the model.

5.3 Results

5.3.1 TCS scores and smoking prevalence

The TCS scores 2007 for the 27 Member States are plotted against national smoking prevalence estimates in Figure 5.1. There was a negative non-significant correlation between these variables (r=-0.17, p=0.39). However, a significant correlation between estimates from the Eurobarometer 2008 survey and TCS scores was found (R=-0.41; p=0.03).

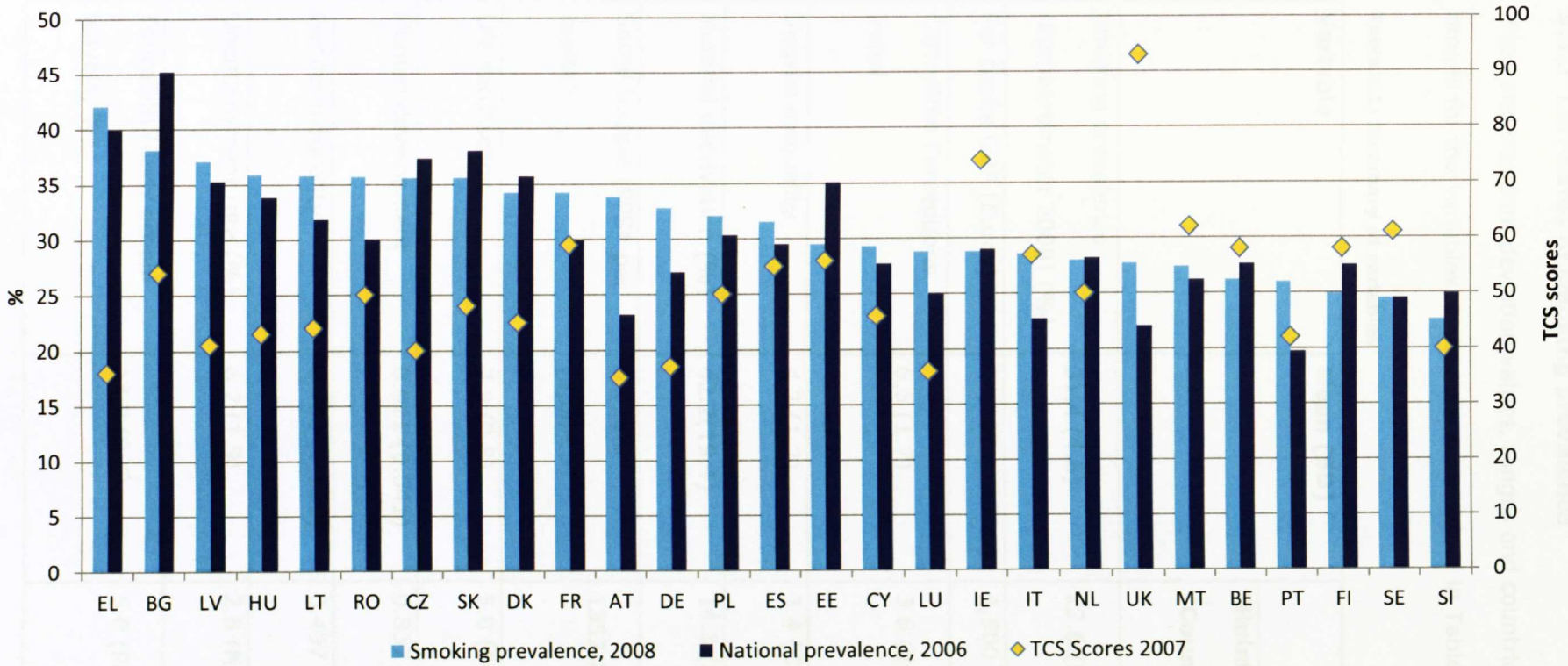

Figure 5.1: National 2006 and Eurobarometer 2008 smoking prevalence estimates and TCS scores for the EU countries (ranked by Eurobarometer 2008 figures)

5.3.2 Correlates of smoking prevalence

Mean and standard deviation values, ranges and countries at the extremes of the ranges for the variables studied are summarised in Table 5.1.

Table 5.1: Summary of variables

Variable	Mean (SD)	Range	
		Minimum (Country)	Maximum (Country)
Smoking prevalence (Eurobarometer 2008) (%)	31.4 (4.8)	22.6 (SI)	42.1(EL)
Per capita GDP (Euros)	24,293 (15,923)	4,500 (BG)	80,500 (LU)
Corruption Perceptions Index	6.5 (1.7)	3.6 (BG)	9.3 (DK)
Income inequality	4.7 (1.2)	3.4 (CZ)	7.3 (LV)
Material deprivation (%)	42.2(19.4)	14.1 (SE)	92.8 (BG)
Social budget (PPS* per capita)	5,615.0 (3,064.5)	1352.2 (RO)	13,231.3 (LU)
Life satisfaction	7.0 (0.8)	5.0 (BG)	8.5 (DK)
Human development	0.921 (0.041)	0.837 (BG)	0.965 (IE)
Gender inequality	0.700 (0.121)	0.497 (RO)	0.906 (SE)
Unemployment rate (%)	6.2 (1.9)	2.8 (NL)	11.3 (ES)
Education (Early school leavers, %)	14.3 (8.5)	5.0 (PL)	39.0 (MT)

Religion as personal value (%)	8.3 (6.9)	2.0 (PT)	27.0 (CY)
Proportion of ex-smokers	20.9 (4.2)	12.7(CY)	29.2(NL)
Tobacco Control Scale scores for smoke free public places	10.5 (5.2)	2.0 (DE)	21.0 (IE)
Proportion of people who work away from home exposed to tobacco smoke in the workplace (%)	22.6 (11.93)	8.0 (SE)	60.0 (EL)
Proportion of indoor workers with no smoking restriction in the workplace (%)	10.8 (7.78)	3.0 (UK)	38.0 (EL)

*SI- Slovenia; EL- Greece; BG- Bulgaria; LU- Luxembourg; DK- Denmark; CZ- Czech Republic; LV- Latvia; SE- Sweden; RO- Romania; IE- Ireland; NL- the Netherlands; ES- Spain; PL- Poland; MT- Malta ; PT- Portugal; CY- Cyprus; AT-Austria, UK- United Kingdom; DE- Germany; *PPS- purchasing power standards*

EU Member States involved in tobacco production in 2008 comprised Belgium, Bulgaria, Germany, Greece, Spain, France, Italy, Hungary, Poland, Portugal, and Romania. Average annual tobacco production (including all 8 groups of variety- flue cured, light air cured, dark air cured, fire cured, sun cured, Basmas, Katerini, Kaba Koulak) was 23.417 (SD 27.129) tonnes, ranging from 131 tonnes in Belgium to 92.556 tonnes in Italy.

Smoking prevalence was significantly correlated with the Corruption Perceptions Index (R=-0.58; p<0.01), *per capita* GDP (R=-0.51; p<0.01), material deprivation (R=0.63; p<0.01), social budget (R=-0.51; p<0.01), life satisfaction (R=-0.62; p<0.01), human development (R=-0.53; p<0.01), gender inequality (R=-0.42; p=0.03), and the proportion of people who used to smoke but have stopped (R=-0.49; p=0.01) indicating that smoking prevalence tends to be higher in countries with lower national incomes, higher levels of public sector corruption and material deprivation, lower social protection expenditure, lower levels of life satisfaction and human development, and higher levels of gender inequality, but lower levels of proportion of ex-smokers. There was no significant correlation between smoking prevalence and income inequality (R=0.32; p=0.10), unemployment (R=0.19; p=0.34), educational level (R=-0.01; p=0.95), importance of religion (R=0.22; p=0.27) or tobacco growing (R=0.16; p=0.63). TCS scores were not included in the model as they reflect implementation of tobacco control policy; the aim of this analysis was to identify characteristics other than tobacco control policy related to smoking prevalence. Correlations between these variables are shown in Table 5.2.

Table 5.2: Correlations between variables

	Smoking prevalence	*Per capita* GDP (Euros)	Corruption Perceptions Index	Income inequality	Material deprivation (%)	Social budget (PPS* per capita)	Life satisfaction	Human development	Gender inequality	Unemployment rate (%)	Education (Early school leavers, %)	Religion as personal value (%)	Tobacco production*	Proportion of ex-smokers	Overall TCS scores	TCS scores for smoke free policy	Daily workplace exposure	No smoking restrictions at work
Smoking prevalence	1.00																	
GDP per capita (Euros)	-0.51 (<0.01)	1.00																
Corruption Perceptions Index	-0.58 (<0.01)	0.89 (<0.01)	1.00															
Income inequality	0.32 (0.10)	-0.41 (0.03)	-0.52 (<0.01)	1.00														
Material deprivation (%)	0.63 (<0.01)	-0.81 (<0.01)	0.81 (<0.01)	0.31 (0.12)	1.00													
Social budget (PPS* per capita)	-0.51 (<0.01)	0.95 (<0.01)	0.85 (<0.01)	-0.41 (0.03)	-0.76 (<0.01)	1.00												
Life satisfaction	-0.62 (<0.01)	0.82 (<0.01)	0.84 (<0.01)	-0.48 (0.011)	-0.88 (<0.01)	0.76 (<0.01)	1.00											

Human development	-0.53 (<0.01)	0.95 (<0.01)	0.83 (<0.01)	-0.37 (0.06)	-0.82 (<0.01)	0.91 (<0.01)	0.82 (<0.01)	1.00									
Gender inequality	-0.42 (0.03)	0.82 (<0.01)	0.79 (<0.01)	-0.23 (0.26)	-0.73 (<0.01)	0.83 (<0.01)	0.65 (<0.01)	0.81 (<0.01)	1.00								
Unemployment rate (%)	0.19 (0.34)	-0.25 (0.21)	-0.33 (0.10)	0.27 (0.17)	0.22 (0.27)	-0.19 (0.34)	-0.27 (0.17)	-0.13 (0.51)	-0.04 (0.84)	1.00							
Education (Early school leavers, %)	-0.01 (0.95)	-0.12 (0.56)	-0.21 (0.30)	0.61 (<0.01)	-0.10 (0.61)	-0.12 (0.55)	-0.18 (0.37)	-0.31 (0.51)	-0.16 (0.43)	0.21 (0.29)	1.00						
Religion as a personal value (%)	0.22 (0.27)	-0.30 (0.13)	-0.37 (0.047)	0.20 (0.330)	0.34 (0.08)	-0.35 (0.08)	-0.11 (0.60)	-0.31 (0.12)	-0.44 (0.03)	0.02 (0.93)	0.03 (0.87)	1.00					
Tobacco production*	0.16 (0.63)	-0.24 (0.48)	-0.43 (0.19)	0.11 (0.76)	-0.07 (0.83)	-0.173 (0.61)	-0.14 (0.69)	0.06 (0.85)	-0.15 (0.67)	-0.04 (0.91)	-0.04 (0.92)	0.06 (0.85)	1.00				
Proportion of ex-smokers	-0.49 (0.01)	0.65 (<0.01)	0.74 (<0.01)	-0.38 (0.05)	-0.70 (<0.01)	0.65 (<0.01)	0.74 (<0.01)	0.68 (<0.01)	0.69 (<0.01)	-0.21 (0.30)	-0.31 (0.12)	-0.18 (0.37)	0.15 (0.67)	1.00			
Overall TCS scores	-0.41 (0.03)	0.12 (0.56)	0.13 (0.57)	0.06 (0.75)	-0.38 (0.05)	0.06 (0.77)	0.39 (0.046)	0.24 (0.22)	0.23 (0.25)	0.12 (0.55)	0.22 (0.27)	0.19 (0.35)	0.15 (0.67)	0.37 (0.06)	1.00		
TCS scores for smoke free policy	-0.31 (0.12)	0.05 (0.08)	-0.03 (0.89)	0.25 (0.22)	-0.36 (0.06)	0.01 (0.98)	0.25 (0.20)	0.18 (0.36)	0.14 (0.51)	0.18 (0.36)	0.24 (0.23)	0.19 (0.34)	0.43 (0.18)	0.21 (0.29)	0.78 (<0.01)	1.00	
Daily workplace	0.75	-0.70	-0.77	0.28	0.71	-0.70	-0.61	-0.71	-0.71	0.07	0.05	0.53	0.34	-0.61	-0.33	-0.26	1.00

exposure	(<0.01)	(<0.01)	(<0.01)	(0.16)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(0.72)	(0.81)	(<0.01)	(0.30)	(<0.01)	(0.10)	(0.20)		
No smoking restrictions at work	0.61 (<0.01)	-0.50 (<0.01)	-0.57 (<0.01)	0.17 (0.40)	0.66 (<0.01)	-0.49 (<0.01)	-0.58 (<0.01)	-0.50 (<0.01)	-0.46 (0.02)	0.11 (0.58)	-0.03 (0.87)	0.33 (0.10)	0.06 (0.86)	-0.58 (0.01)	-0.48 (0.01)	-0.41 (0.03)	0.80 (<0.01)	1.00

*Only 11 countries included; p-values for the association provided in brackets

In the final model the following variables explaining smoking prevalence were included: Corruption Perceptions Index scores, per capita GDP, income inequality, material deprivation, social budget, life satisfaction, Human Development Index, Gender Empowerment measures, unemployment rate, education, importance of religion, quantities of tobacco production and proportion of ex-smokers. In a multiple linear regression model with backwards exclusion (by excluding the least significant variable at each step), starting with all variables significant in univariate analysis, smoking prevalence was independently significantly associated only with the Corruption Perceptions Index score (data shown in Figure 5.2; prevalence decreasing by 1.62 (95% CI 0.63 to 2.61) per unit on the Corruption Perceptions Index score, $p<0.01$). The Corruption Perceptions Index score accounted for 29.5% of the variance of smoking prevalence, and was the only variable included in the final model. Results were similar when alternative modelling technique (by excluding one variable at time and carrying out likelihood ratio test) was used searching for the model explaining most of the variance in smoking prevalence. There was evidence for some but not high levels of multicollinearity (variance inflation factor 3.07).

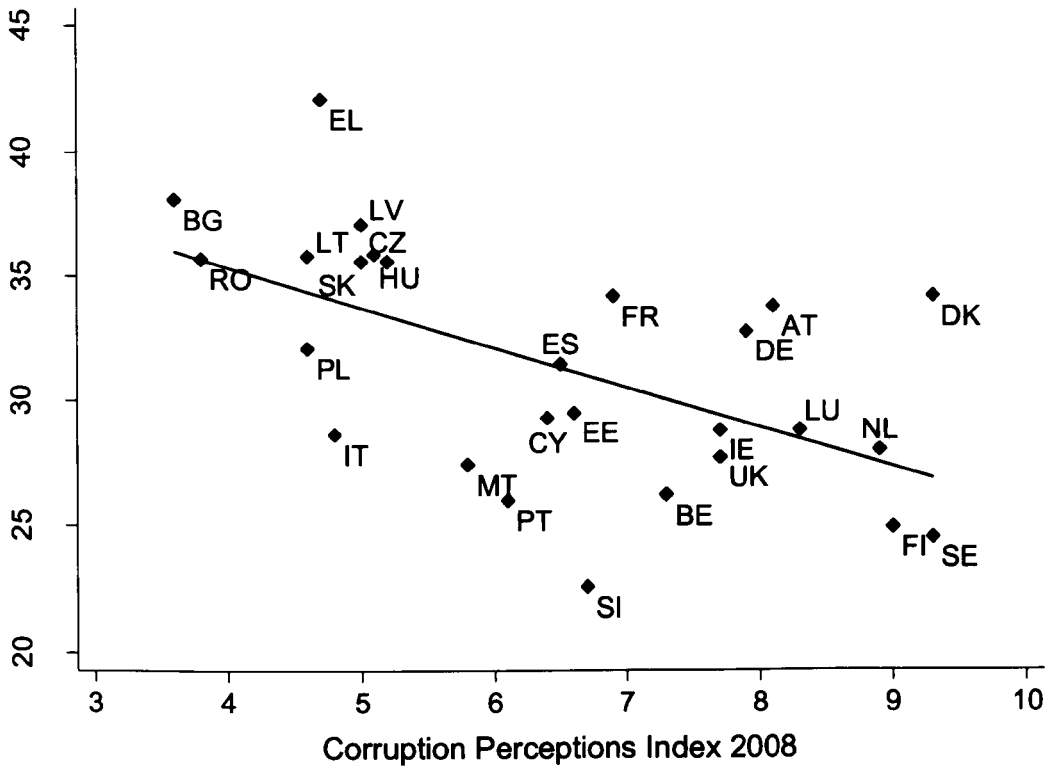

Figure 5.2: Smoking prevalence and Corruption Perceptions Index score (2008 data)

Since the Human Development Index included components of GDP and educational enrolment, the multiple regression was repeated excluding this variable; in this model, the Corruption Perceptions Index and Material Deprivation were the last two variables retained in the model with Material Deprivation being the significant correlate. When this alternative modelling technique was used the highest R^2 was obtained when Corruption Perceptions Index and material deprivation were included in the model (R^2=32.4%) however in this case none of the variables were significantly correlated with smoking prevalence.

To explore the possibility that this finding might differ between old EU countries and new EU countries the backward regression analysis was run separately in these groups of countries. In the new EU Member States Corruption Perception

Index was the only independently significant predictor of smoking prevalence ($p<0.01$), and accounted for 63% of the variance in smoking prevalence. In old EU countries, the last variable retained was Gender Empowerment Measure ($p=0.08$).

5.3.3 Corruption, TCS scores and smoke-free policy enactment and implementation

The relationship between policy implementation and enactment was investigated based on a model of interaction of policy, practice and country characteristics as illustrated in Figure 5.3.

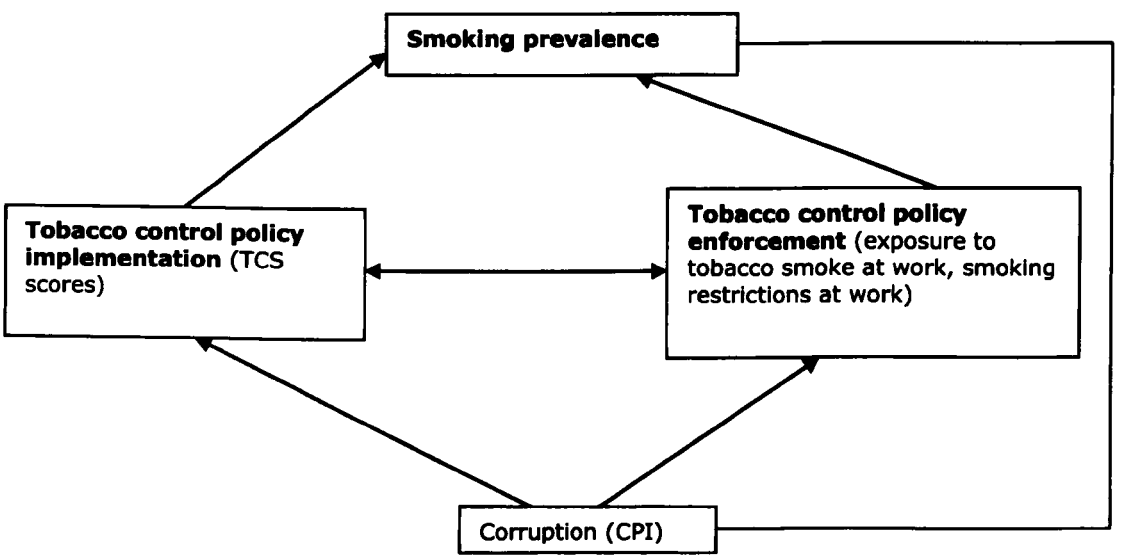

Figure 5.3: Model of interaction between tobacco control policies, corruption and smoking prevalence

This model assumes that enactment of and compliance with recognised tobacco control policies should, with time, result in lower smoking prevalence; but also

that corruption at government level is likely to inhibit enactment and enforcement, and at population level, compliance.

TCS scores were significantly inversely correlated with smoking prevalence (R=-0.41; p=0.03), suggesting that smoking prevalence tends to be lower in countries with more comprehensive enactment of tobacco control policies in place. When enforcement of policy was investigated in relation to smoking prevalence it was found that TCS scores for smoke-free policy (an indicator of policy enforcement) were significantly and inversely correlated (R=-0.41; p=0.03) with the proportion of the population reporting no smoking restrictions at work (indicator of policy enforcement) suggesting that smoking prevalence tends to be lower in countries where smoke-free policy is enforced. However, there was no correlation between TCS scores for smoke- free policy and another indicator of policy enforcement- the proportion reporting exposure to tobacco smoke in the workplace (R=-0.26; p=0.20). Further perceived corruption in relation to enactment and enforcement of smoke-free policy was investigated. Corruption Perceptions Index scores were unrelated to overall TCS scores (R= 0.13; p=0.57) or TCS scores for the existence of smoke-free policy (R=-0.03; p=0.89) suggesting that policy implementation is not necessarily affected by corruption. However, Corruption Perceptions Index scores were strongly correlated with the prevalence of workplace exposure (R=-0.77; p<0.01) and an absence of smoking restrictions in the workplace (R=-0.45; p=0.02) suggesting that corruption might affect policy enforcement. As it was assumed that workplace exposure is likely to be higher in countries with higher smoking prevalence, association between perceived corruption and enforcement of smoke-free policy was adjusted for smoking prevalence. The correlation between the Corruption Perceptions Index and workplace exposure remained significant (R=-0.45; p=0.02) after controlling for the effect of smoking prevalence. This suggests that although implementation of smoke- free policy might not be

influenced by levels of perceived corruption, it is possible that enforcement of smoke-free policy is affected by corruption. TCS scores for smoke-free policy were also not significantly correlated with any other country characteristic variables (Table 5.2.), or with smoking prevalence (R=-0.31; p=0.12).

The consistency of the relation between corruption and enforcement of smoke free policy was investigated additionally using data from the 2009 Eurobarometer survey. Overall TCS scores were not correlated with smoking prevalence (R=-0.12; p=0.57). Analysis of TCS scores for smoke free policies revealed that they were not correlated with overall proportion of people being exposed to tobacco smoke at workplace (R=-0.27; p=0.17) and were not correlated with Corruption Perceptions Index (R=0.004; p=0.98) suggesting that implementation of smoke free policy (as in the legislation) is not related with enactment of policy. However, Corruption Perceptions Index was correlated with the proportion of people exposed to tobacco smoke at the workplace (R=-0.64; p<0.01). As smoking prevalence was correlated with both Corruption Perceptions Index (R=-0.48; p=0.01) and the proportion exposed to tobacco smoke (R=0.67; p<0.01) the correlation between these two variables was adjusted for smoking prevalence and the association was borderline significant (R=-0.34; p=0.095). As the data on daily exposure included all and not only those working away from home, the relationship between Corruption Perceptions Index and the proportion exposed to tobacco smoke was further adjusted for the proportion of those working away from home, and the association remained borderline significant (R=-0.39; p=0.06).

Repetition of this analysis in old and new EU Member States did not reveal any marked differences between them.

5.4 Discussion

5.4.1 Main findings

The extent to which policies to prevent smoking have been implemented varies substantially across the EU. The relationship between smoking prevalence and implementation of tobacco control was inconsistent and differed between sources of prevalence data used. Smoking prevalence tends to be higher in countries with generally lower levels of income and wellbeing on a range of different measures, but particularly in countries with higher levels of perceived public sector corruption. This association appears to be particularly marked among the newer EU Member States. It was also found that whilst the enactment of policies to prevent exposure to tobacco smoke in the workplace was no less likely in relatively corrupt countries, exposure to tobacco smoke in the workplace was greater, suggesting a failure to implement or adhere to smoke-free regulations. Overall the findings from this thesis suggest that tobacco companies could be more likely to thrive in countries with relatively poor levels of governance and that effective smoking prevention measures are less likely to be enforced in these countries.

5.4.2 Comparison with previous research

The heterogeneity of smoking prevalence between countries arises in part from their being at different stages of smoking epidemic, which in turn reflects differences in social and economic development. However the progression of the epidemic is also determined by the extent to which comprehensive tobacco control policies have been implemented. Smoking is also more prevalent in socioeconomically deprived populations and people with lower levels of education and income[377], and exacerbates deprivation and inequality[361]. However, not only wealth but other country characteristics, for example, corruption, might

influence success in tobacco control, and in this study corruption remained significantly correlated with smoking prevalence even after allowing for GDP. Whilst corruption itself contributes to poverty[360] and is inversely correlated with GDP, and poorer countries in the EU tend to be at an earlier stage of the smoking epidemic[378], it is also plausible that strong commercial interests such as the tobacco industry are likely to thrive in corrupt environments in which tobacco control measures can more easily be delayed or devalued. In this study smoke free policy is used as an example of tobacco control policies where corruption might play an significant role. On the data available it was not possible to study the implementation of other tobacco control policies in a similar way, though the World Bank has reported that in countries with higher corruption, tobacco smuggling is more common[379].

5.4.3 Strengths and limitations

This is the first study to explore the role of country characteristics, and in particular, perceived public sector corruption in determining smoking prevalence and the extent to which smoke free policies are implemented and observed.

There were several limitations in this study. These include the fact that the findings were based on cross-sectional ecological analyses and therefore need to be interpreted with caution, particularly in relation to any causal inference. The Corruption Perceptions Index is only one of several measures of corruption, but its major strength is that it combines data from various sources into one index. The Index is primarily focused on views of business people and country analysts, and is designed to provide a cross-sectional rather than longitudinal assessment of corruption levels. However a validation study has reported that levels of perceived corruption obtained using various measures correlate strongly with the Corruption Perceptions Index, making it a valid estimate of perceived

corruption[380]. It was also not possible to carry out a more robust analysis of the longitudinal relation between corruption and smoking prevalence by the fact that the methods and sources used to construct the Corruption Perceptions Index vary from year to year, and are therefore not directly comparable over time.

In the previous chapters it has been shown that prevalence estimates based on national surveys may be more valid estimates of prevalence than those from the small sample sizes used in Eurobarometer[381]. However, the same analyses on smoke free policy implementation using data from other sources (Eurobarometer 2009) was conducted and very similar results to those reported above were found. Smoking prevalence rather than cigarette consumption data were analysed in this study, as prevalence is a stronger determinant of population health burden. However, it would be useful to investigate whether corruption and other country characteristics are related to cigarette per capita sales data in a similar way.

In the analysis a limited number of variables were included, and in some cases years for the variables could not be matched with the year for which smoking prevalence data were used. However, it is not likely that significant changes would occur if data from previous year are used. Also, it was not possible to obtain data on the extent to which the tobacco industry operates in the country.

5.4.4 Conclusions

Tobacco companies have a vested interest in and a history of inhibiting both enactment of and compliance with tobacco control policies[74], and Article 5.3 of the World Health Organization's Framework Convention on Tobacco Control[354], which is approved by the European Council and ratified by almost all EU countries, suggests that tobacco control policies should be protected from commercial interests. However, when decisions on tobacco control are made,

economic interests are affected and financial or other incentives to defer or dilute policy may well come into play. These need not involve direct individual financial gain; the financial benefit might arise from donations to political parties or provision of benefits in kind. This study suggests that strong governance is important in preventing tobacco smoking, and strong and transparent political leadership has a key role in ensuring that effective tobacco control policies are both implemented and observed in the EU. Results from this study suggest that reducing public sector corruption might help to improve success in tobacco control, especially, proper enforcement of public places and workplaces smoking restrictions. However further work is required to explore the likely underlying causal associations between the characteristics studied and efforts to prevent smoking at national level.

Chapter 6 Cigarette prices and affordability in the European Union

6.1 Introduction

6.1.1 Cigarette price and consumption

As mentioned in Chapter 1, tobacco price increases typically lead to a decrease in both cigarette consumption and smoking prevalence[77,173], of an estimated 5%[167,382] and 3.5-4% respectively[169,383] in response to a 10% price rise. This effect appears to be relatively independent of absolute price levels[171], but is also dependent on changes in purchasing power, since increases in income can partially or completely offset the impact of increases in price[173].

Cigarettes in high income countries are generally much more expensive yet more affordable than in low income countries, with exceptions in the UK and New Zealand, which have been reported as two high income countries with relatively low cigarette affordability[171]. Affordability changes over time along with changes in cigarette prices and income, and it has been estimated that in high income countries the annual rate of decrease in affordability between 1997 and 2006 was about 2%[180]. For example, in the UK in the year 2008 tobacco was 14.5% less affordable than in 1980[384]. However, in many countries cigarette price increases fail to keep up with increases in the general price level [174]. Therefore when comparing the extent to which different countries have used price as a tobacco control measure, it is important to compare affordability as well as absolute price.

6.1.2 Measurements of cigarette affordability

Cigarette affordability can be measured in several ways, and previous approaches have explored cigarette prices in relation to national income (Relative Income Price (RIP))[171,177,180], salaries and wages[174,177,180] and also by using a simple but enduring measure of discretionary purchasing power, the *Big Mac* index)[178,365]. Use of the price of a *Big Mac* hamburger has been suggested

by the *Economist* as a light hearted measure of purchasing power as *Big Mac* hamburgers are produced using the same recipe in 120 countries and therefore can be regarded as identical for currency translations. The *Big Mac* index for cigarette affordability is calculated as a number of cigarettes that can be purchased for the price of one *Big Mac* hamburger[178,365]. RIP is calculated by adjusting cigarette price for national wealth by estimating the proportion of the *per capita* Gross Domestic Product (GDP) required to purchase 2000 cigarettes higher RIP meaning lower level of affordability[171,177,180]. The main advantages of using p*er capita* GDP measure as an estimate of income is the use of consistent methodology and availability of annual data[171]. Cigarette prices have also been estimated in relation to hourly wages as the average number of working minutes required to earn the cost of a pack of 20 cigarettes[174,177,180] or the ratio of the price of one pack of cigarettes to daily income focusing on lower income groups[179].

6.1.3 Cigarette affordability in the EU

In the European Union (EU), cigarette prices vary substantially between Member States[274,385,386], and there have been attempts to compare affordability by adjusting for national income[274,385] and the purchasing power of currencies[386]. However, the affordability of cigarettes using all of the above measures has not been comprehensively compared across the current 27 EU Member States.

6.1.4 Aim of the chapter

The aim of this chapter was to use a range of price and affordability measures to explore the consistency of differences in affordability between countries, and the extent to which contemporary cigarette affordability varies between EU Member States; and hence to determine whether affordability is being used consistently

as a tobacco control measure in the EU. This study further aims to investigate relations between income, cigarette price and affordability.

6.2 Methods

Three measures of cigarette affordability were estimated for all 27 EU Member States: the Relative Income Price, minutes of labour, and the *Big Mac* index. These measures all relate national cigarette prices to a measure of income, or in the case of the *Big Mac* index, to the cost of a Macdonald's *Big Mac* as a simple measure of purchasing power parity.

6.2.1 Cigarette Prices

A range of cigarette price measures was available and included prices for various cigarette categories in different currencies:

Most Popular Price Category (MPPC)

The MPPC was a benchmark EU price category which reflects the price of a popular brand or brands typically occupying about 35% of the national cigarette market[261]. Data are published by the European Commission twice each year as the price of 1000 MPPC cigarettes, in Euros and national currency, for all 27 Member States[387]. For this study data collected in July 2008 were used. For Malta, data were available for 'king size' and 'small size' cigarettes, and differed slightly; the 'king size' estimates were used for analysis. Price of 1000 MPPC cigarettes are provided in national currency and Euros. From 2011 MPPC has been replaced with weighted average price (WAP).

World Health Organisation cheapest brand cigarette price

The price of a pack of 20 of the cheapest brand of cigarettes in 24 Member States in 2008 (data for Cyprus, the Netherlands, Luxembourg not available), in US dollars, was obtained from the World Health Organization (WHO) Report on the Global Tobacco Epidemic[388].

World Health Organisation most sold cigarette price

The price of a pack of 20 of the most popular ('most-sold') brand of cigarettes in each of the 27 Member States in 2008, in US dollars, was obtained from the WHO Report on the Global Tobacco Epidemic[388].

Cost of 20 *Marlboro* brand cigarettes

Supermarket and mid-priced stores retail prices for a pack of 20 *Marlboro* cigarettes in Member State capital cities, in national currency, US dollars and Euros at the exchange rate at the time of the survey, were obtained from the Economist Intelligence Unit (EIU) Worldwide Cost of Living survey data published in EIU CityData database[389]. Data for Worldwide Costs of Living survey are gathered for 140 cities in 93 countries every year during the first week of March and first week of September in supermarkets, medium-priced stores and more expensive speciality shops[390]. Data were available for 21 Member States (all except Cyprus, Estonia, Lithuania, Latvia, Malta and Slovenia) and were collected in September 2008, except for Slovakia, for which the available price was for March 2008[359].

Cost of popular local brand cigarettes

Supermarket and mid-priced store retail prices for a pack of 20 local brand cigarettes in Member State capital cities, in national currency, US dollars and Euros at the exchange rate at the time of the survey, were obtained from the EIU. Within this survey the local brand price is defined as a snapshot of price of any popular and widely available local brand deemed to be of sufficient quality for popular consumption and reflects a non-internationally branded popular option. Data were available for 21 Member States (all except Cyprus, Estonia, Lithuania, Latvia, Malta and Slovenia) and were collected in September 2008, except for Slovakia, for which the available price was for March 2008[359].

6.2.2 Income, wages and discretionary purchasing power

National income

Income at national level was measured using *per capita* gross domestic product (GDP) data at market prices which is defined as the final result of the production activity of resident producer units. Attempts were made to obtain GDP data in each of the currencies used at least from two sources and compare them. Initially data on *per capita* GDP provided by Eurostat (in Euros and national currency)[391], International Monetary Fund Economic Outlook Database (in national currency and US dollars)[392] and United Nations Statistics Division (in US dollars)[368] were used.

Wages

Typical wages in different countries by using data on average hourly wages from a sample of 14 occupations, net of tax and social security contributions, as provided in US dollars by the Union Bank of Switzerland (UBS) 'Prices and Earnings Survey' for capital cities of all Member States except Malta were estimated[393]. Recent data were available for 2006 and 2009; and 2009 data were used for analysis. Net hourly wages were converted into Euros for analysis using currency exchange rates cited in the report.

Discretionary purchasing power

Big Mac prices in national currency in June 2008 for 26 Member States (data not available for Luxembourg) were obtained from *The Economist*, and all non-Euro figures were converted into Euros using exchange rates quoted on national bank or international currency exchanges website[353] for the mid June (16th June 2008 as data for 15th June were not available).

6.2.3 Data selection

Since price and income data were available from a range of sources initial analysis was performed to identify all possible affordability measures (Table 6.1).

Table 6.1: Summary of affordability measures

Category of cigarette	Source of price, currency	Source of income, currency
RIP (%)		
MPPC	Eurostat, EUR	Eurostat, EUR
MPPC	Eurostat, national currency	Eurostat, national currency
MPPC	Eurostat, national currency	IMF, national currency
Cheapest	WHO, USD	UN, USD
Cheapest	WHO, USD	IMF, USD
Most sold	WHO, USD	UN, USD
Most sold	WHO, USD	IMF, USD
Marlboro, supermarket	EIU, national currency	Eurostat, national currency
Marlboro, supermarket	EIU, national currency	IMF, national currency
Marlboro, Mid-priced store	EIU, national currency	Eurostat, national currency
Marlboro, Mid-priced store	EIU, national currency	IMF, national currency
Local brand, supermarket	EIU, national currency	Eurostat, national currency
Local brand, supermarket	EIU, national currency	IMF, national currency
Local brand, Mid-priced store	EIU, national currency	Eurostat, national currency
Local brand, Mid-priced store	EIU, national currency	IMF, national currency
Marlboro, supermarket	EIU, EUR	Eurostat, EUR
Marlboro, Mid-priced store	EIU, EUR	Eurostat, EUR
Local brand, supermarket	EIU, EUR	Eurostat, EUR
Local brand, Mid-priced store	EIU, EUR	Eurostat, EUR
Minutes of Labour affordability		
Cheapest	WHO, USD	Net hourly wages, USD
Most sold	WHO, USD	Net hourly wages, USD
Marlboro, supermarket	EIU, USD	Net hourly wages, USD
Marlboro, mid-priced store	EIU, USD	Net hourly wages, USD
Local brand, supermarket	EIU, USD	Net hourly wages, USD
Local brand, mid-priced store	EIU, USD	Net hourly wages, USD
MPPC	Eurostat, EUR	Net hourly wages, EUR
Big Mac index for cigarette affordability		
MPPC	Eurostat	Big Mac price, national currency
MPPC	Eurostat, EUR	Big Mac price, EUR
Marlboro, supermarket	EIU, national currency	Big Mac price, national currency
Marlboro, supermarket	EIU, EUR	Big Mac price, EUR
Marlboro, mid-priced store	EIU, national currency	Big Mac price, national currency
Marlboro, mid-priced store	EIU, EUR	Big Mac price, EUR
Local brand, supermarket	EIU, national currency	Big Mac price, national currency
Local brand, supermarket	EIU, EUR	Big Mac price, EUR
Local brand, mid-priced store	EIU, national currency	Big Mac price, national currency
Local brand, mid-priced store	EIU, EUR	Big Mac price, EUR

Three price measures (MPPC, the most sold cigarette price, and *Marlboro* cigarette prices (as purchased in a supermarket)) were assessed before selecting two of them for final analysis. As there was little discrepancy between *per capita* GDP data provided from various sources *per capita* GDP estimates in Euros, obtained from the Eurostat database[394], for the year 2008 for all Member States was selected except Austria and Romania, for which at the time of analysis the

most recent figures were for 2007[395]. The other two income measures included in the affordability analysis were net hourly wages in Euros and a price of a *Big Mac* in Euros. Where possible data provided in the same currency and calendar year were used, typically the Euro and 2008.

6.2.4 Measures of Affordability

Relative income price

The Relative income price (RIP)[171] is the proportion of *per capita* GDP necessary to buy 100 packs of 20 cigarettes. Therefore RIP estimates for MPPC cigarettes for all 27 Member States, and for *Marlboro* cigarette for the 21 Member States for which price data were available were generated. All data were from 2008.

Minutes of labour

The number of minutes of labour necessary to buy 20 MPPC and 20 *Marlboro* cigarettes[174,396] was estimated by dividing the respective prices by the net hourly wage estimate of salary earned in one minute. Price data were for 2008, wage data for 2009.

Big Mac index

The *Big Mac* index of cigarette affordability[178,365] was estimated as the number of MPPC or *Marlboro* cigarettes that could be purchased in each country for the price of one McDonald's *Big Mac* hamburger, using 2008 prices in Euros.

6.2.5 Price ratio

In order to assess the most appropriate price category for estimating affordability price ratio between most popular price category and *Marlboro* price was calculated. Then correlation analysis between price ratio and *per capita* GDP was done to estimate if in countries with lower average income most popular price tends to be significantly lower than *Marlboro* price which is used as an international standard.

6.2.6 Statistical analysis

For the analysis SPSS v.17 was used and association between variables was estimated using Spearman Rank correlation, which is less likely to be influenced by outliers.

6.3 Results

6.3.1 Cigarette prices

The mean price of 20 MPPC cigarettes in all 27 Member States in 2008 was 3.33 Euros (SD 1.80), with a nearly seven-fold range from 1.19 Euros in Latvia to 8.12 Euros in the UK. The mean price of 20 cigarettes in the WHO most-sold category in each country was 4.69 US dollars (SD 2.19), with a six-fold range from 1.83 US dollars in Lithuania to 11.27 US dollars in Ireland. The mean price of 20 *Marlboro* cigarettes in the 21 Member States for which data were available was 3.95 Euros (SD 1.49), with a four-fold range from 1.77 Euros in Romania to 7.55 Euros in Ireland. Member States are shown ranked according to MPPC price in Figure 6.1. Since MPPC and most-sold cigarette prices showed a similar range as well as country ranking, we excluded the most-sold category from further analysis, retaining MPPC to compare popular cigarette prices, and *Marlboro* prices to compare prices of the same brand in different countries as both these price categories were available in Euros which is national currency in the majority of EU countries.

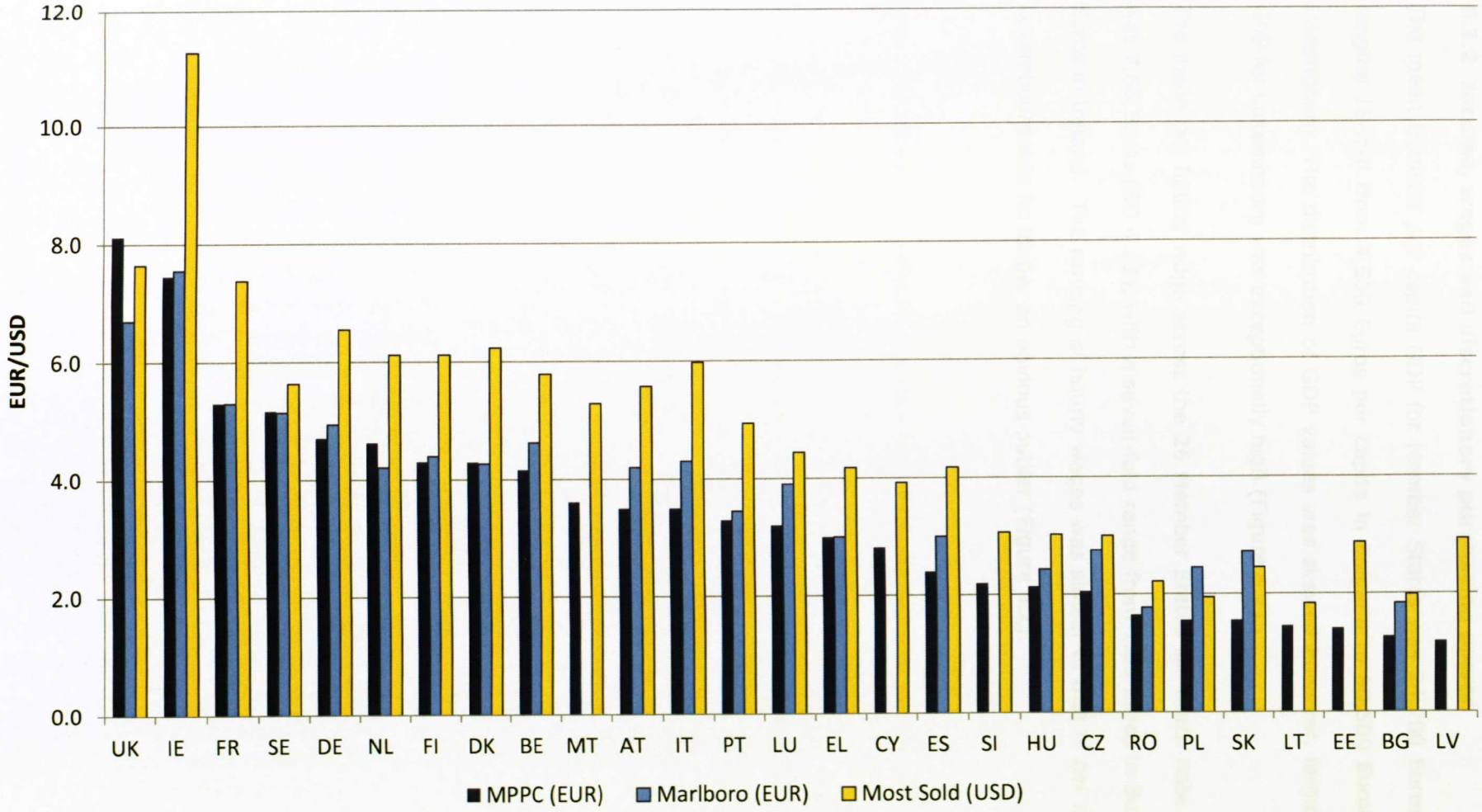

Figure 6.1: Price of MPPC, Marlboro and Most Sold cigarette categories (ranked by MPPC cigarette price)

6.3.2 Income, wages and discretionary purchasing power

The mean Eurostat *per capita* GDP for Member States was 24,200 Euros (SD 15,900), ranging 18-fold from 4,500 Euros per capita in Bulgaria to 80,500 Euros per capita in Luxembourg. The distribution of GDP values was skewed however, largely because the GDP for Luxembourg was exceptionally high (Figure 6.2).

The mean net hourly wage across the 26 Member States for which data were available was 7.68 Euros (SD 4.03), with a seven-fold range from 1.99 Euros in Bulgaria to 14.31 Euros in Ireland. The ranking of hourly wages was similar to that of per capita GDP, but Luxembourg was no longer an obvious outlier (Figure 6.2).

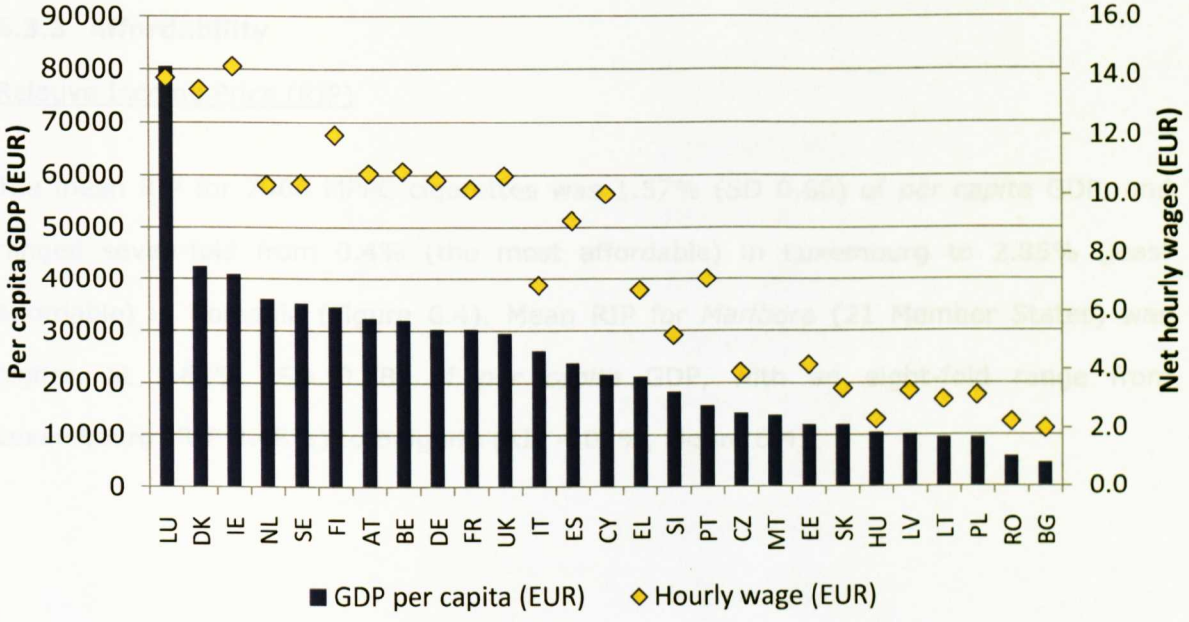

Figure 6.2: Income data for the EU countries (ranked by *per capita* GDP in Euros)

The mean price of a *Big Mac* hamburger meal in the 26 Member States with available data was 2.81 (SD 0.63) Euros, ranging from 1.68 Euros in Bulgaria to 4.06 Euros in Sweden (a 2.4-fold range; Figure 6.3). *Big Mac* price data were not available for Luxembourg.

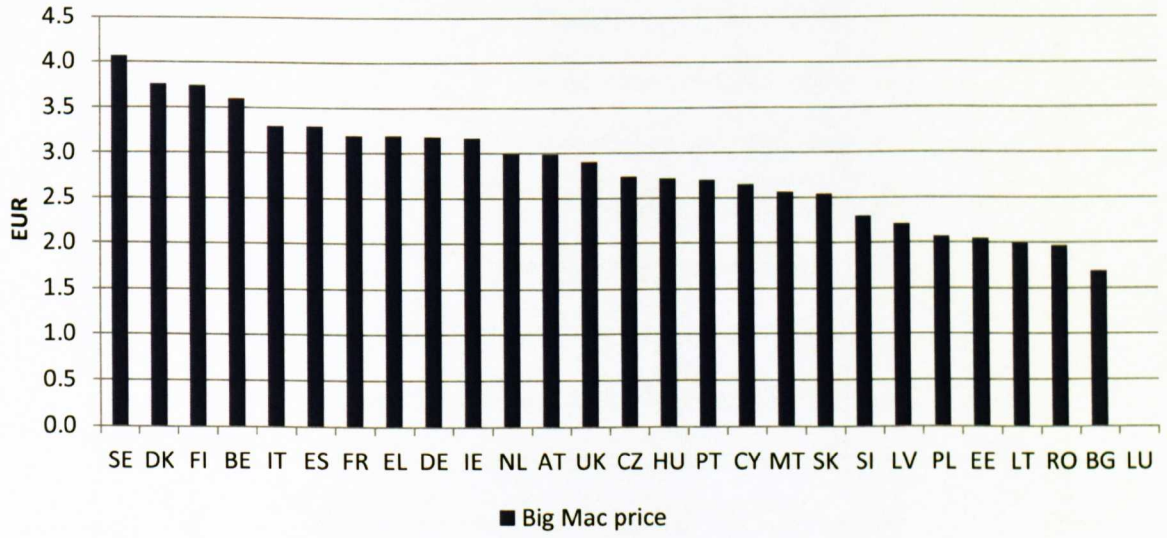

Figure 6.3: *Big Mac* prices for the EU countries

6.3.3 Affordability

Relative Income Price (RIP)

The mean RIP for 2000 MPPC cigarettes was 1.57% (SD 0.60) of *per capita* GDP, and ranged seven-fold from 0.4% (the most affordable) in Luxemburg to 2.85% (least affordable) in Romania (Figure 6.4). Mean RIP for *Marlboro* (21 Member States) was higher, at 1.82% (SD 0.78) of *per capita* GDP, with an eight-fold range from Luxembourg (RIP 0.48%) to Bulgaria (RIP 4.07%, Figure 6.4).

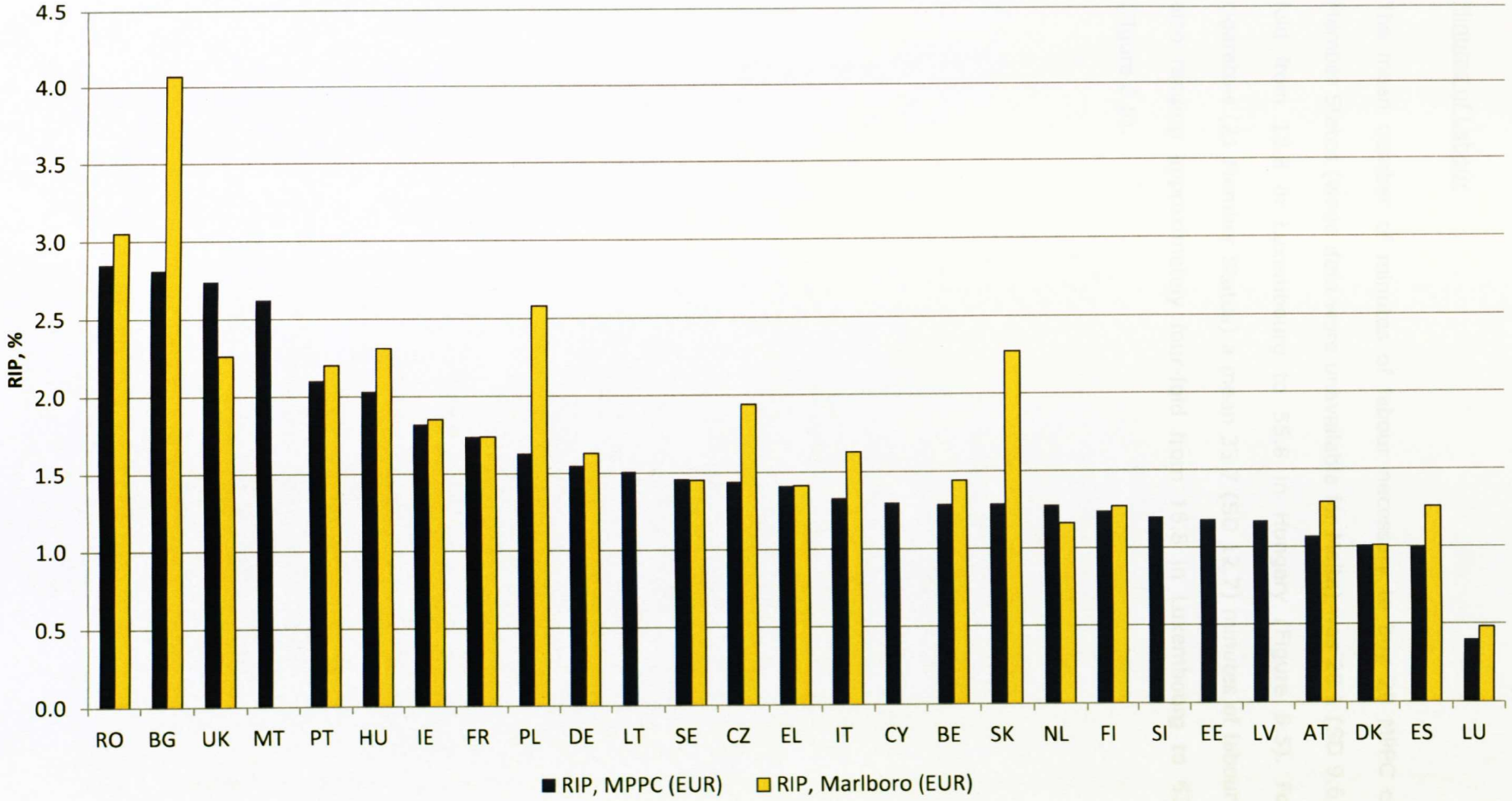

Figure 6.4: RIP for MPPC and *Marlboro* cigarettes (ranked by RIP for MPPC cigarettes)

Minutes of Labour

The mean number of minutes of labour necessary to buy 20 MPPC cigarettes in 26 Member States (wage data were unavailable for Malta) was 28.1 (SD 9.6), ranging four-fold from 13.8 in Luxembourg to 55.8 in Hungary (Figure 6.5). For 20 *Marlboro* cigarettes (21 Member States) a mean 33.7 (SD 12.7) minutes of labour were required, also ranging approximately four-fold from 16.8 in Luxembourg to 63.5 in Hungary (Figure 6.5).

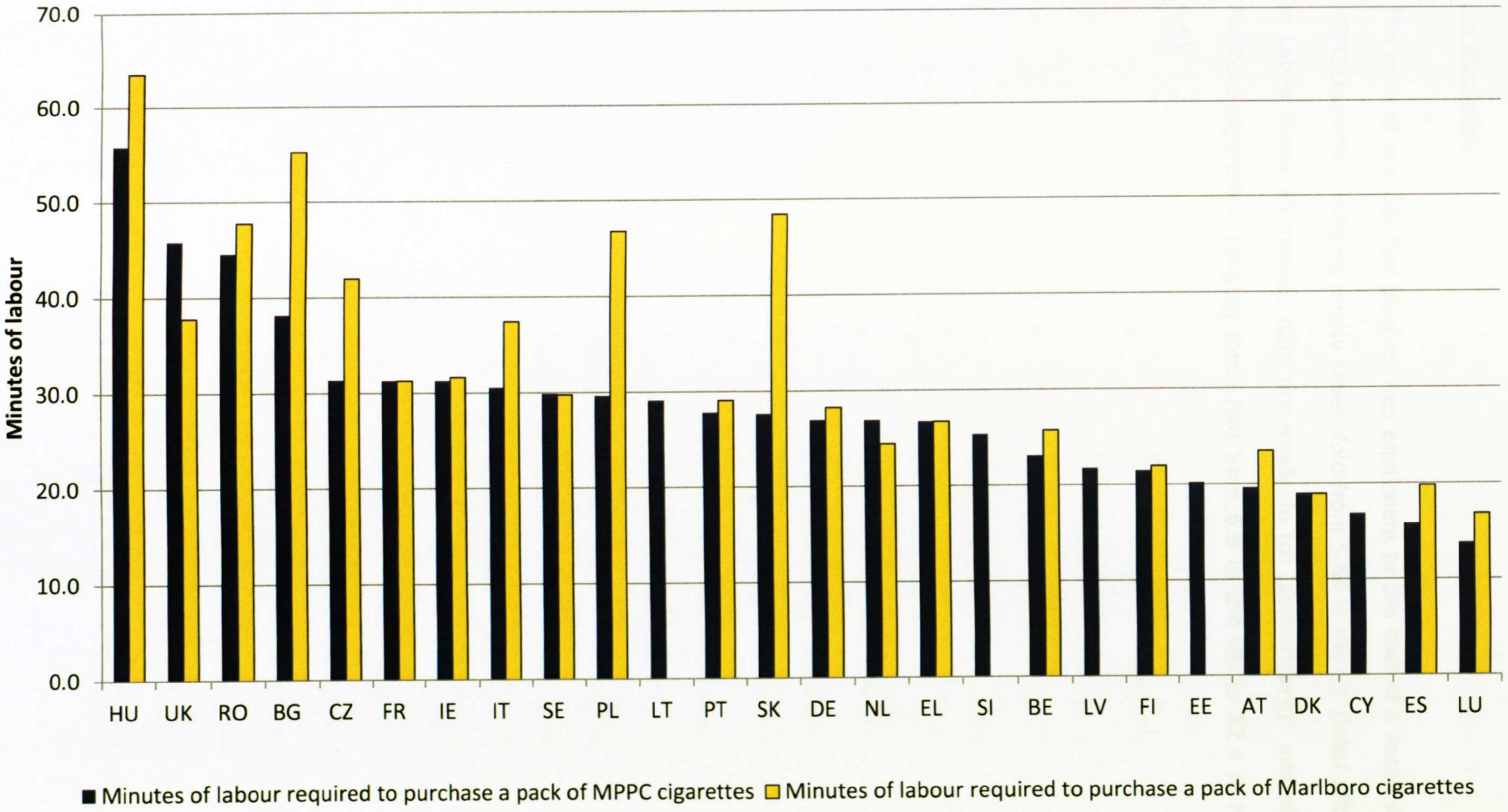

Figure 6.5: Minutes of labour required to purchase a pack of MPPC and *Marlboro* cigarettes (ranked by MPPC affordability measure)

Big Mac index

The price of one *Big Mac* product was equivalent to the cost of a mean of 20.4 (SD 7.5) MPPC cigarettes, ranging nearly seven-fold from 5.64 in the UK (least affordable) to 37.0 in Latvia (most affordable; data not available for Luxembourg); and of 16.4 (SD 4.3) *Marlboro* cigarettes, ranging three-fold from 6.8 in the UK to 22.4 in Hungary (Figure 6.6).

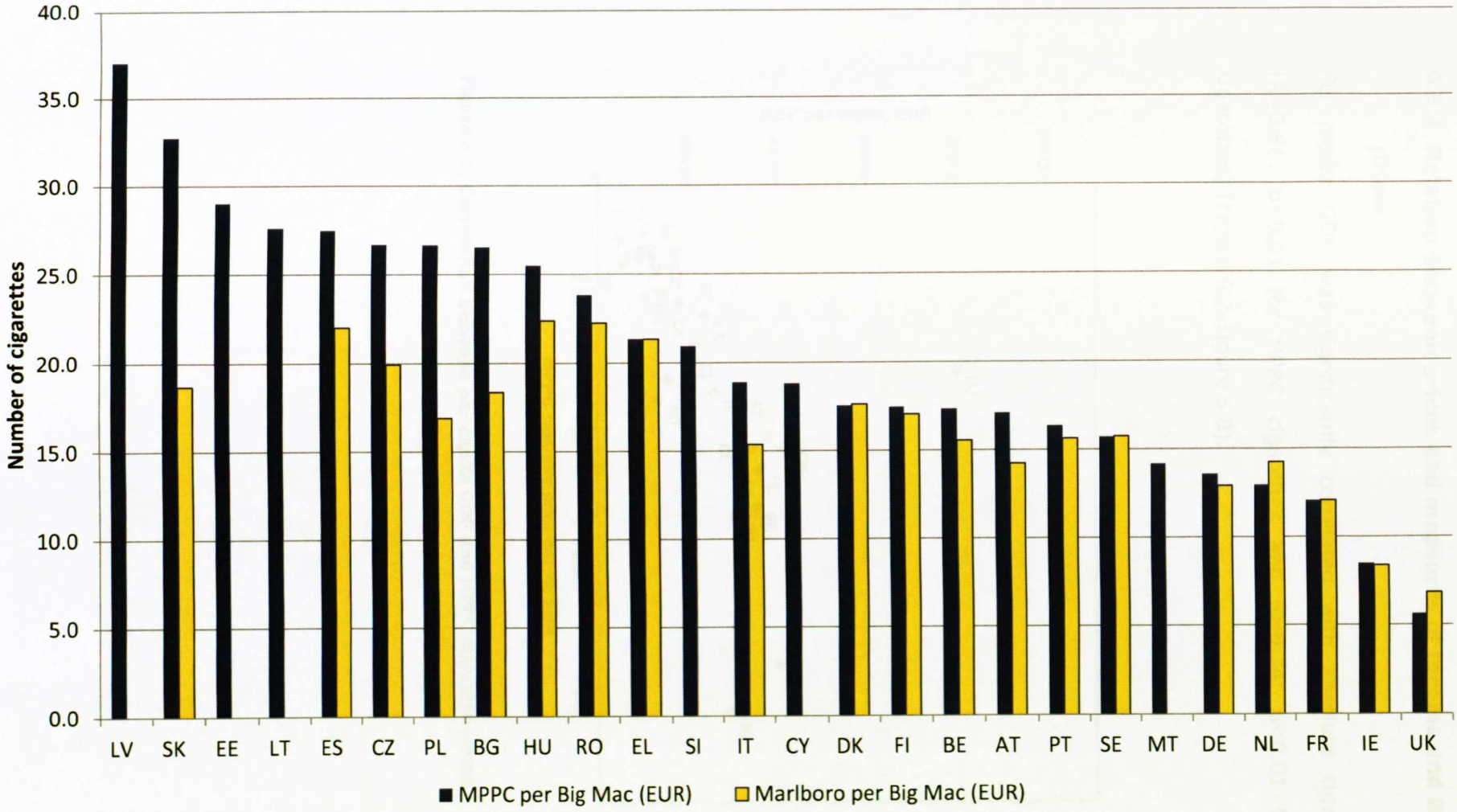

Figure 6.6: Number of MPPC and *Marlboro* cigarettes per price of one McDonald's *Big Mac* (ranked by MPPC cigarette affordability)

6.3.4 Relation between prices and measures of income and Big Mac prices

Per capita GDP was significantly correlated with absolute cigarette prices (R=0.81; p<0.01 for MPPC cigarettes and R=0.74; p<0.01 for *Marlboro* cigarettes) (Figure 6.7-Figure 6.8).

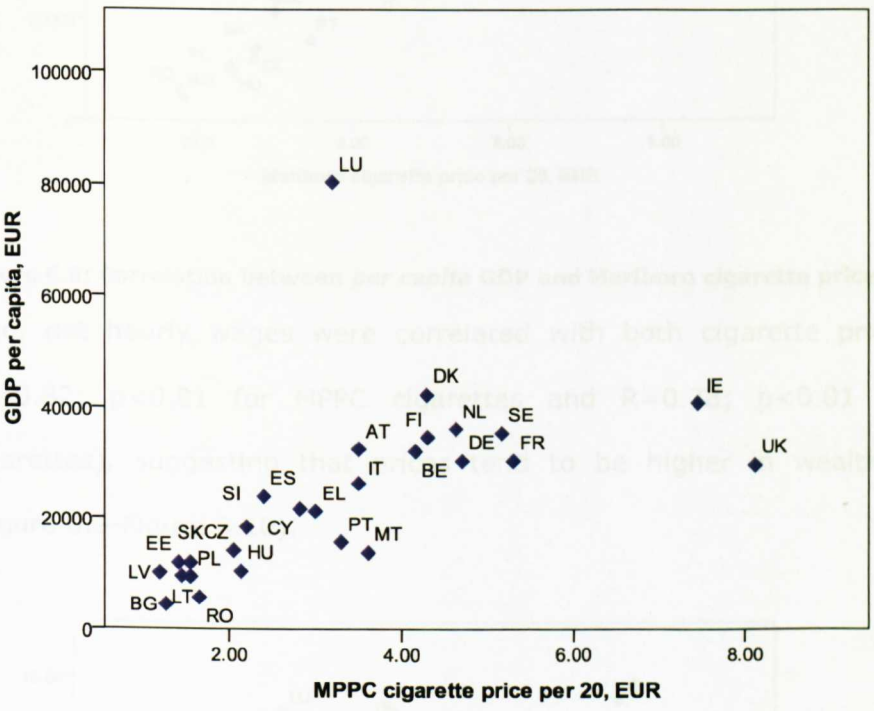

Figure 6.7: Correlation between *per capita* GDP and MPPC cigarette prices

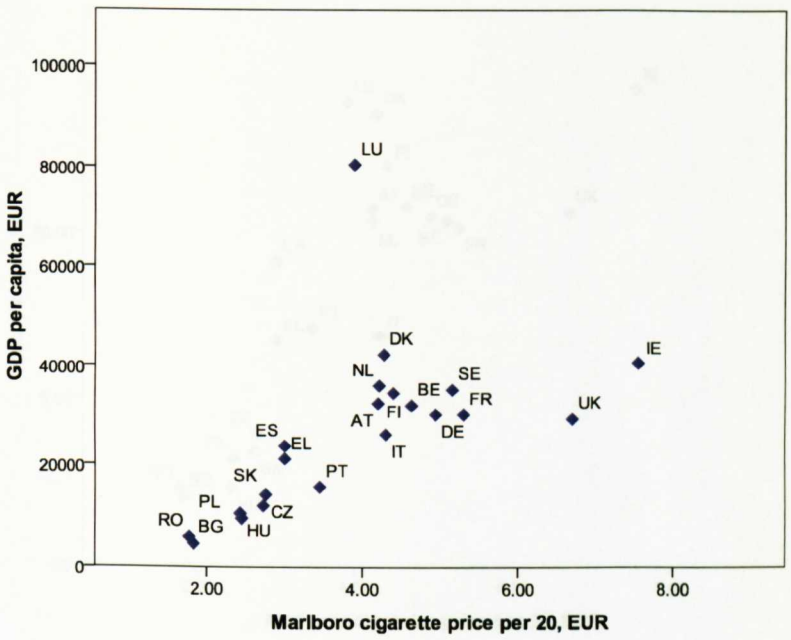

Figure 6.8: Correlation between *per capita* GDP and Marlboro cigarette prices

Also, net hourly wages were correlated with both cigarette price categories (R=0.82; p<0.01 for MPPC cigarettes and R=0.78; p<0.01 for Marlboro cigarettes), suggesting that prices tend to be higher in wealthier countries (Figure 6.9-Figure 6.10).

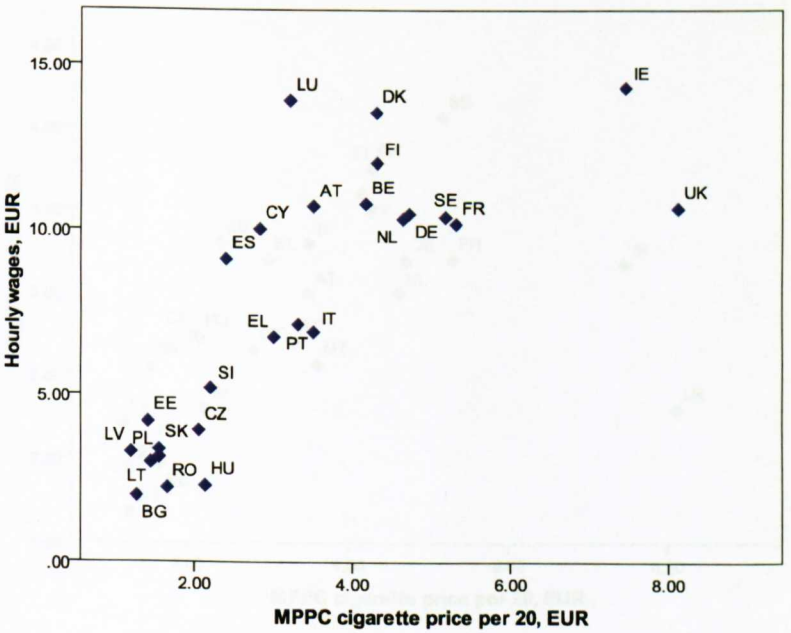

Figure 6.9: Correlation between hourly wages and MPPC cigarette prices

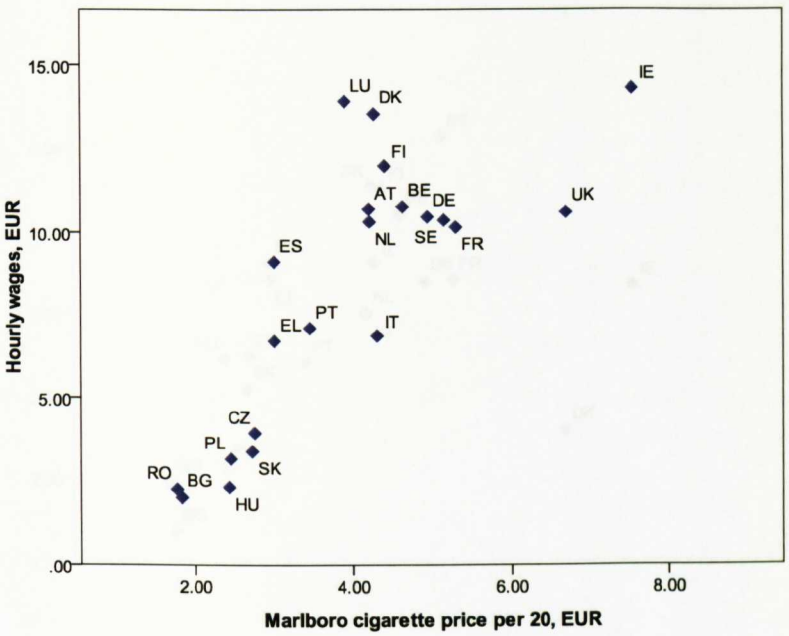

Figure 6.10: Correlation between hourly wages and *Marlboro* cigarette prices

The price of a *Big Mac* meal was also strongly correlated with MPPC (R=0.68; p<0.01) and *Marlboro* prices (R=0.58; p<0.01) (Figure 6.11-Figure 6.12).

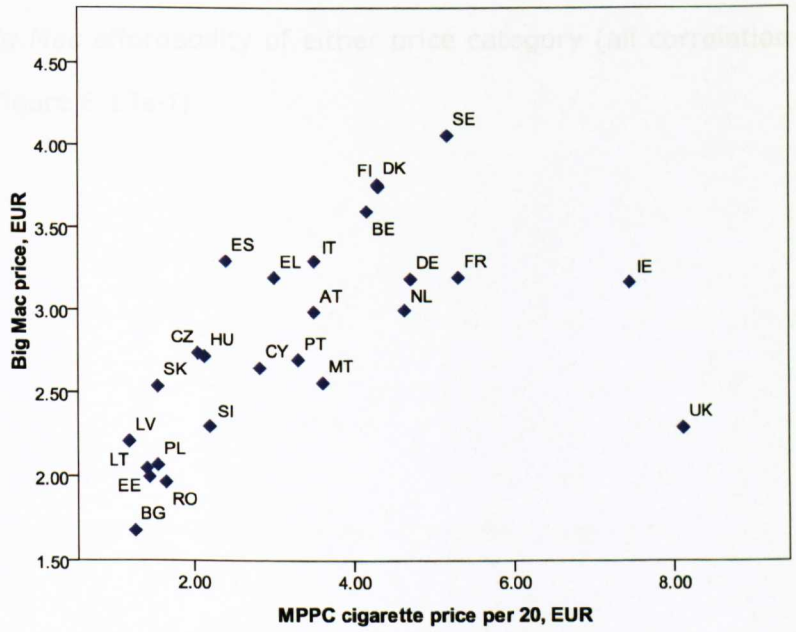

Figure 6.11: Correlation between *Big Mac* price and MPPC cigarette prices

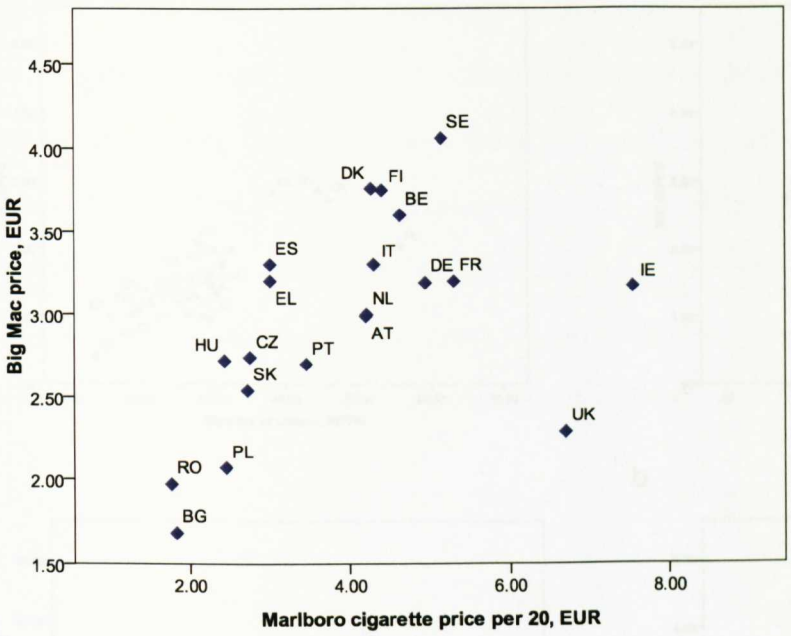

Figure 6.12: Correlation between *Big Mac* price and *Marlboro* cigarette prices

6.3.5 Relations between affordability measures

RIP and Minutes of Labour affordability were closely correlated for both MPPC ($R=0.88$, $p<0.01$) and *Marlboro* ($R=0.95$, $p<0.01$) cigarettes, but unrelated to *Big Mac* affordability of either price category (all correlation coefficients $R<0.3$) (Figure 6.13a-f).

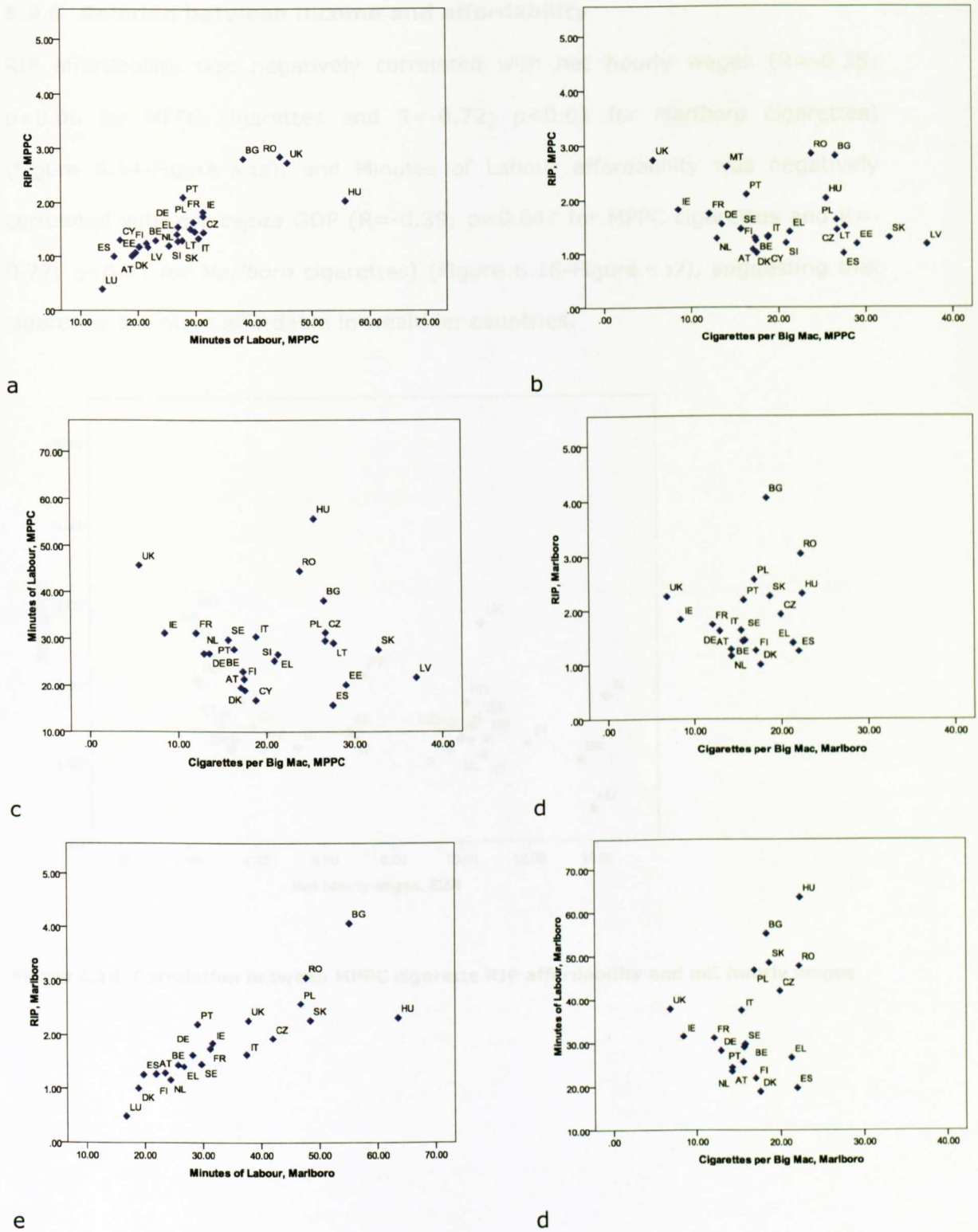

Figure 6.13: Correlation between affordability measures

6.3.6 Relation between income and affordability

RIP affordability was negatively correlated with net hourly wages (R=-0.38; p=0.06 for MPPC cigarettes and R=-0.72; p<0.01 for *Marlboro* cigarettes) (Figure 6.14-Figure 6.15), and Minutes of Labour affordability was negatively correlated with *per capita* GDP (R=-0.39; p=0.047 for MPPC cigarettes and R=-0.77; p<0.01 for *Marlboro* cigarettes) (Figure 6.16-Figure 6.17), suggesting that cigarettes are more affordable in wealthier countries.

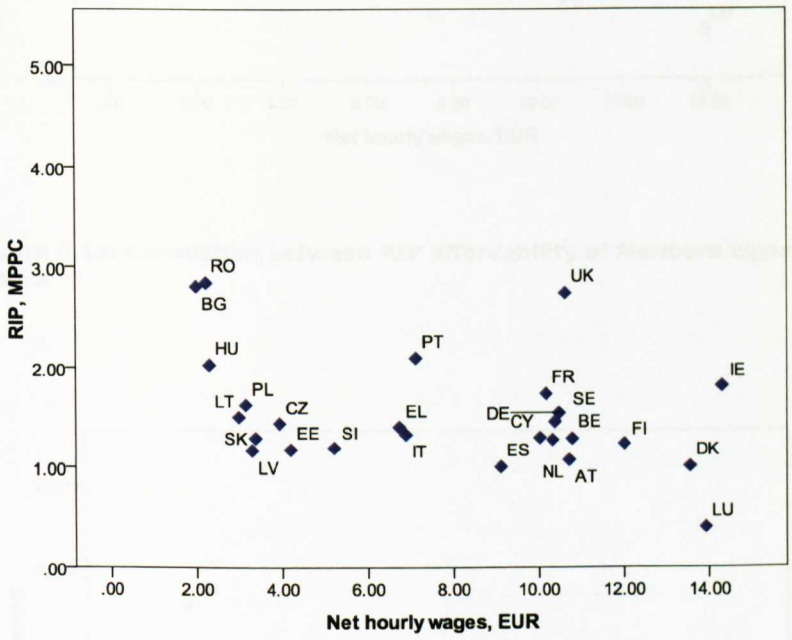

Figure 6.14: Correlation between MPPC cigarette RIP affordability and net hourly wages

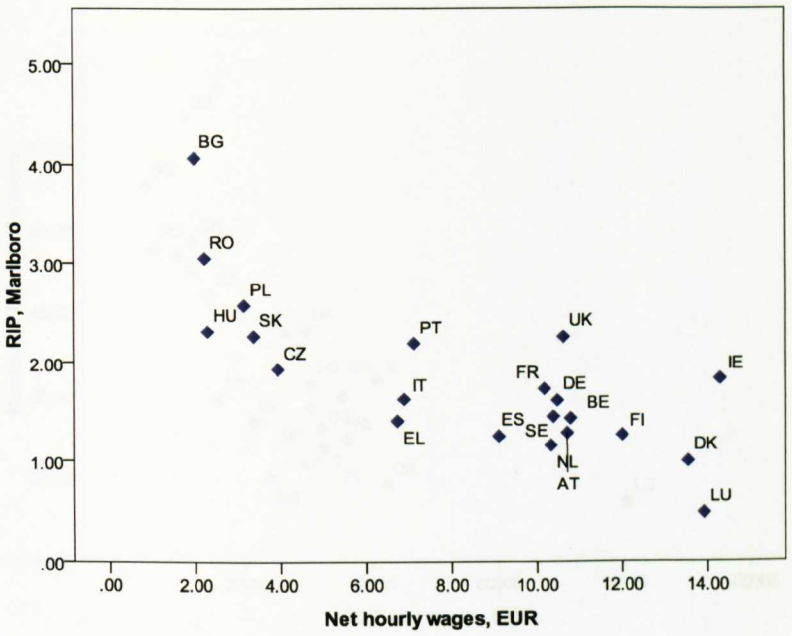

Figure 6.15: Correlation between RIP affordability of *Marlboro* cigarettes and net hourly wages

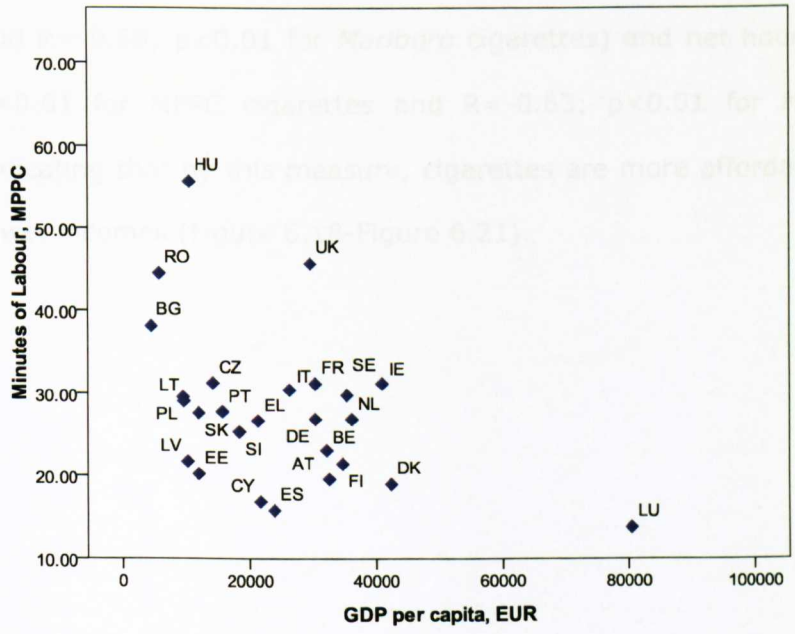

Figure 6.16: Correlation between Minutes of Labour affordability of MPPC cigarette and *per capita* GDP

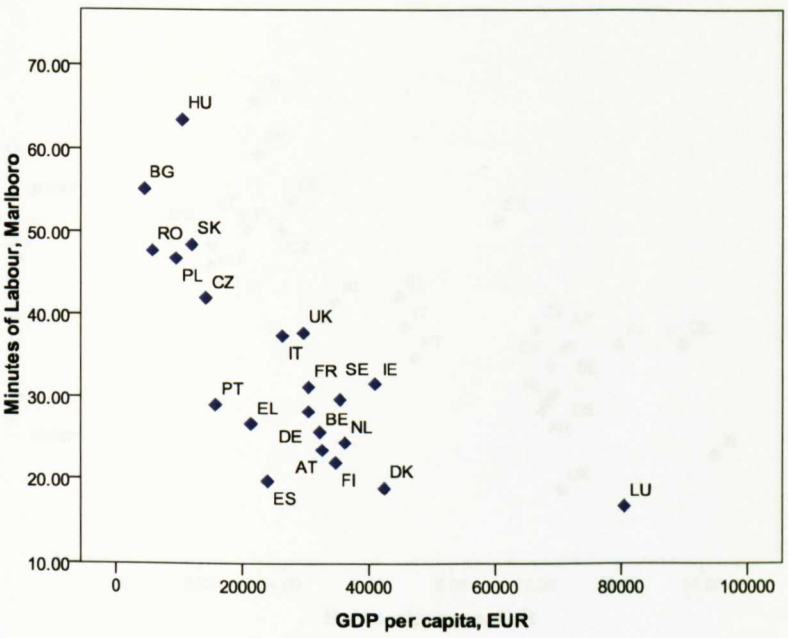

Figure 6.17: Correlation between *Marlboro* cigarette Minutes of Labour affordability and *per capita* GDP

In contrast, the *Big Mac* index for cigarette affordability was significantly inversely correlated with *per capita* GDP (R=-0.71; p<0.01 for MPPC cigarettes and R=-0.58; p<0.01 for *Marlboro* cigarettes) and net hourly wages (R=-0.76; p<0.01 for MPPC cigarettes and R=-0.63; p<0.01 for *Marlboro* cigarettes), indicating that by this measure, cigarettes are more affordable in countries with lower incomes (Figure 6.18-Figure 6.21).

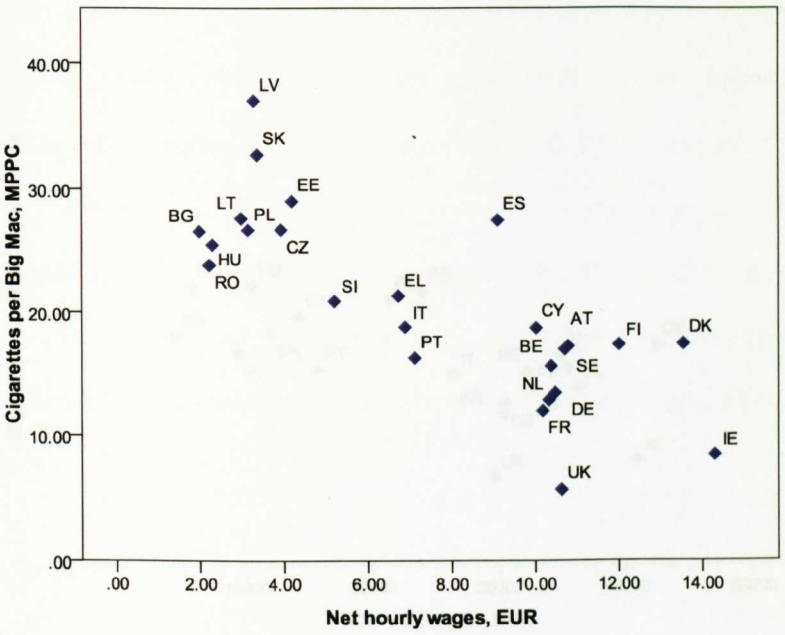

Figure 6.18: Correlation between *Big Mac* index for MPPC cigarette affordability and net hourly wages

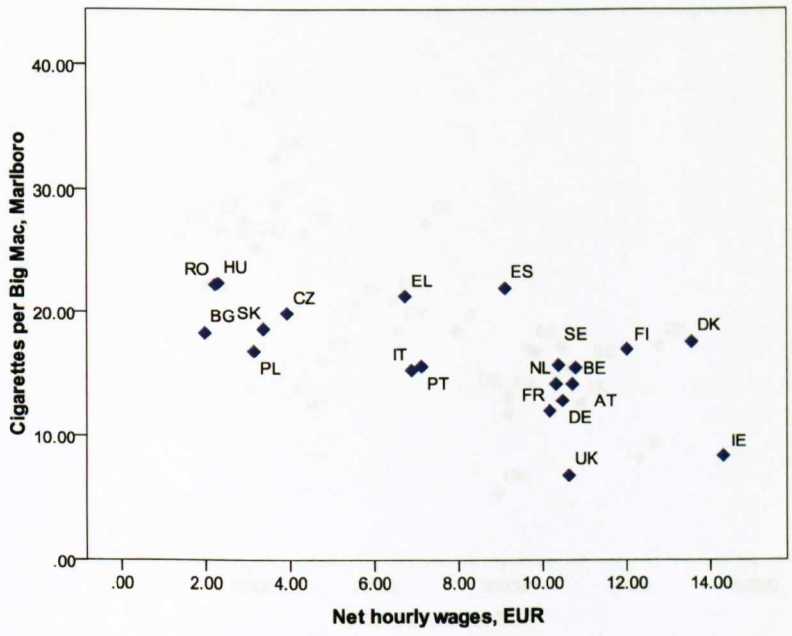

Figure 6.19: Correlation between *Big Mac* index for *Marlboro* cigarette affordability and net hourly wages

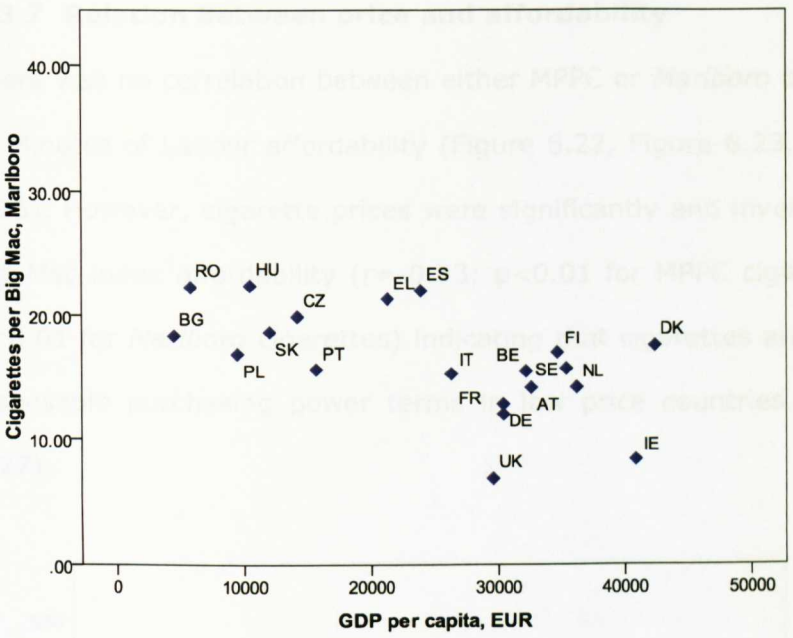

Figure 6.20: Correlation between *Big Mac* index for MPPC cigarette affordability and *per capita* GDP

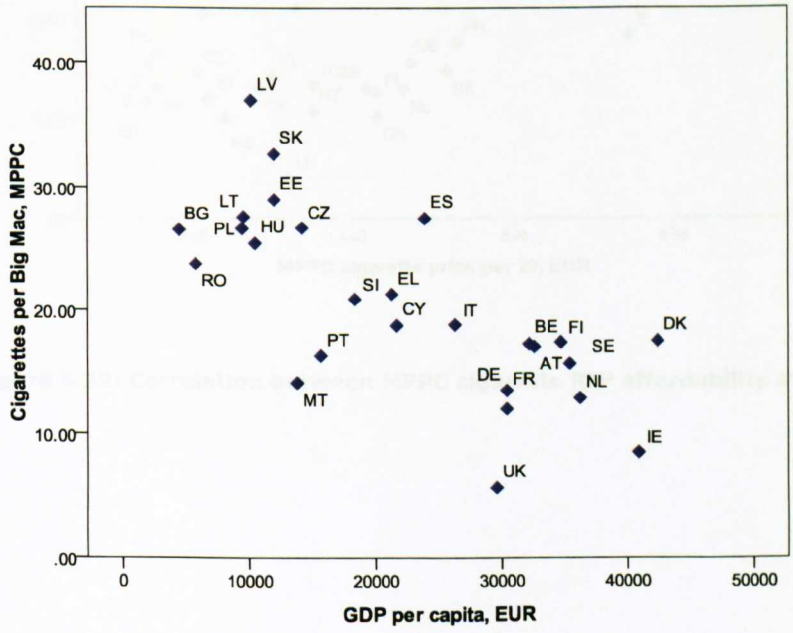

Figure 6.21: Correlation between *Big Mac* index for *Marlboro* cigarette affordability and *per capita* GDP

6.3.7 Relation between price and affordability

There was no correlation between either MPPC or *Marlboro* prices and either RIP or Minutes of Labour affordability (Figure 6.22, Figure 6.23, Figure 6.24, Figure 6.25). However, cigarette prices were significantly and inversely correlated with *Big Mac* index affordability ($r=-0.93$; $p<0.01$ for MPPC cigarettes and $r=-0.82$; $p<0.01$ for *Marlboro* cigarettes) indicating that cigarettes are more affordable in disposable purchasing power terms in low price countries (Figure 6.26-Figure 6.27).

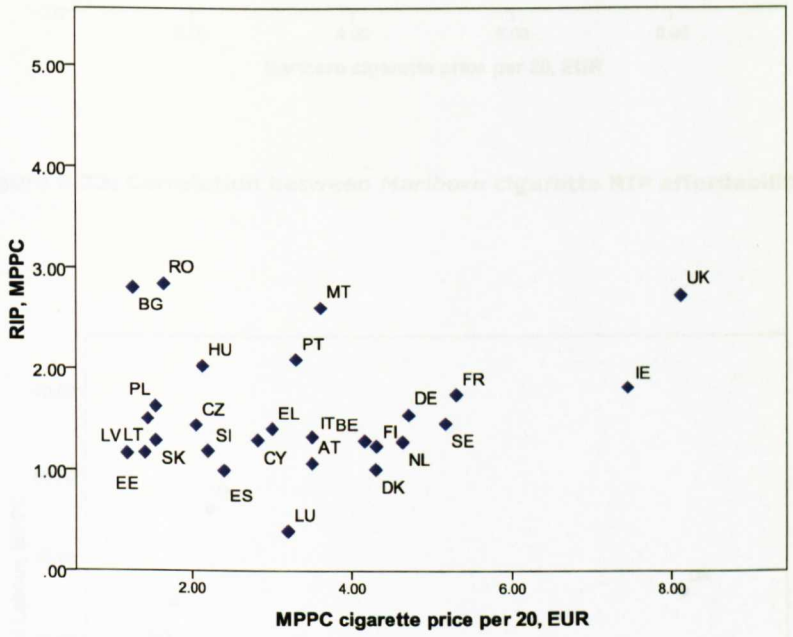

Figure 6.22: Correlation between MPPC cigarette RIP affordability and cigarette prices

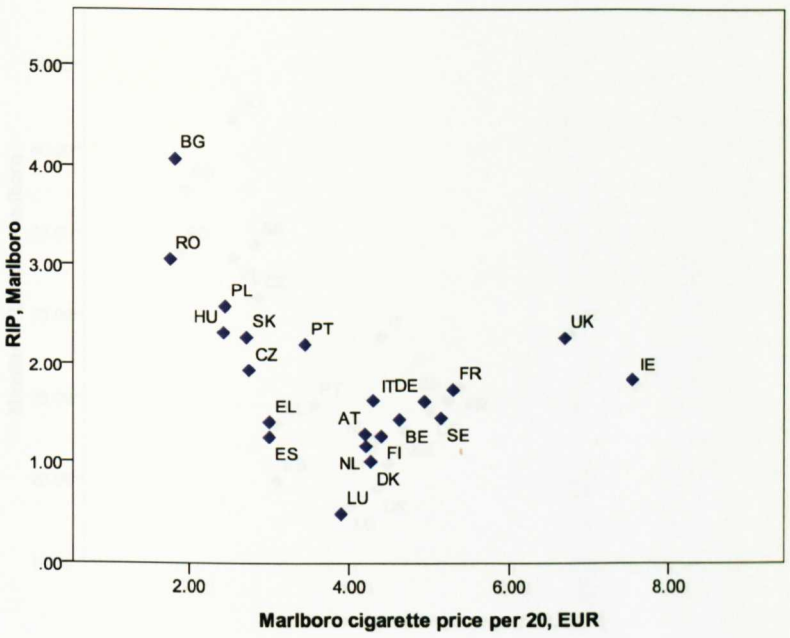

Figure 6.23: Correlation between *Marlboro* cigarette RIP affordability and cigarette prices

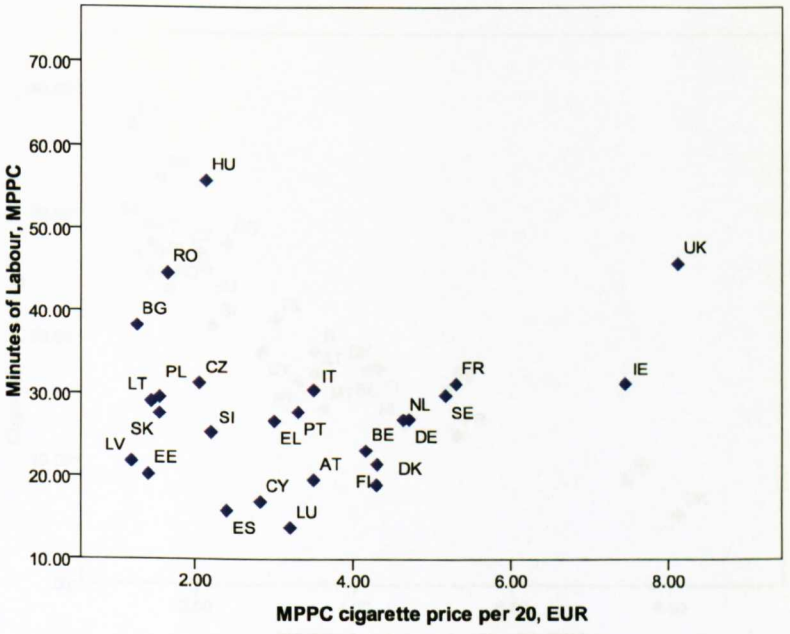

Figure 6.24: Correlation between MPPC cigarette Minutes of Labour affordability and cigarette prices

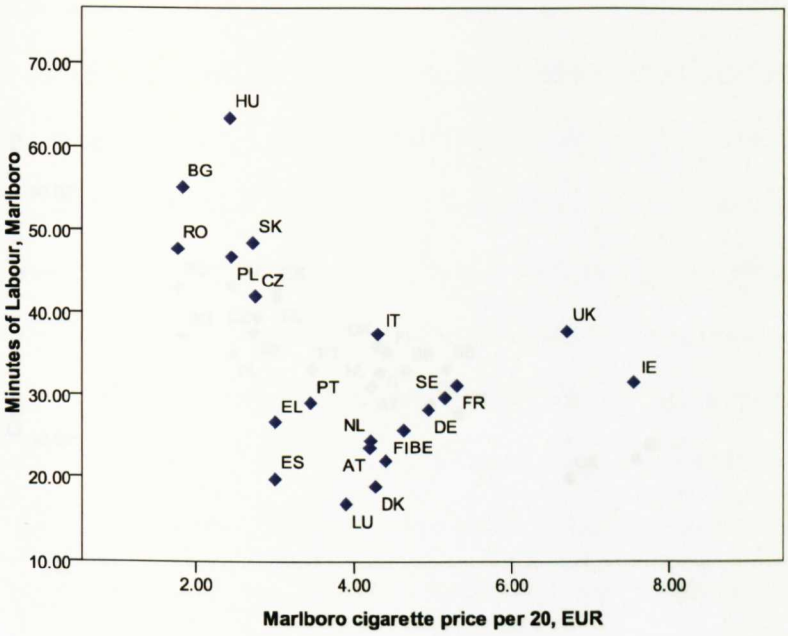

Figure 6.25: Correlation between *Marlboro* cigarette Minutes of Labour affordability and cigarette prices

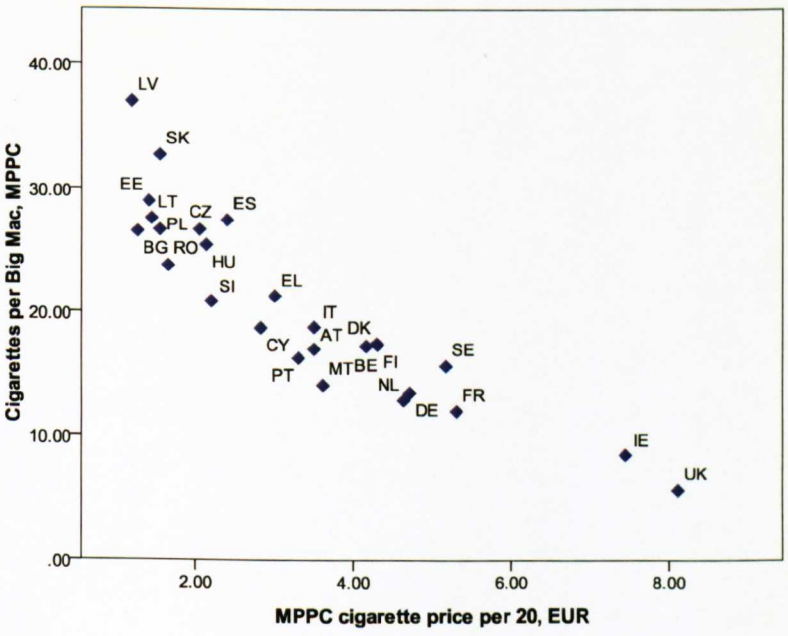

Figure 6.26: Correlation between *Big Mac* index for MPPC cigarette affordability and cigarette prices

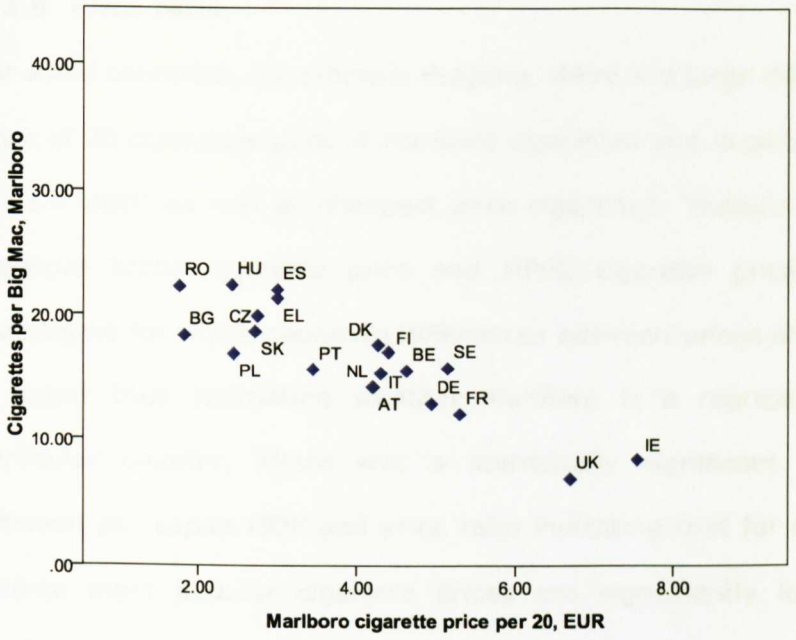

Figure 6.27: Correlation between *Big Mac* index for *Marlboro* cigarette affordability and cigarette prices

6.3.8 Price ratio

For some countries, for example Bulgaria, there is a large difference between the price of 20 cigarettes pack of *Marlboro* cigarettes and local brand price (2.6 USD vs. 1.4 USD) as well as cheapest price cigarettes. Therefore the ratio between *Marlboro* brand cigarette price and MPPC cigarette price was calculated to investigate for which countries differences between prices of different categories is larger thus estimating whether *Marlboro* is a representative brand in a particular country. There was a statistically significant positive correlation between *per capita* GDP and price ratio indicating that for countries with lower income most popular cigarette prices are significantly lower than *Marlboro* (R=0.54; p=0.01;Figure 6.28) and therefore use of *Marlboro* as a price standard would not be the best choice to describe affordability in countries with relatively low income at the European Union level, and also might be questioned as an indicator of success in tobacco control policy.

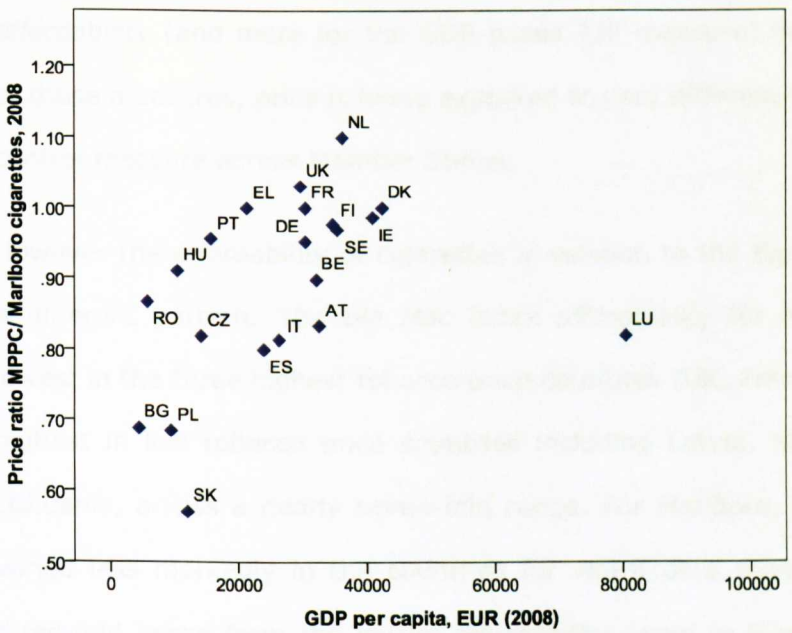

Figure 6.28: Price ratio between MPPC cigarettes and *Marlboro* cigarettes in relation to per capita GDP

6.4 Discussion

6.4.1 Main findings

This study analyses a range of different measures of cigarette price and affordability in the current 27 EU Member States, and aims to explore the extent to which affordability differs between them. All price measures were strongly correlated, and hence largely interchangeable, and show around six-fold variation between countries while GDP measures varied much more, largely because of high *per capita* GDP in Luxembourg. The ranking of cigarette affordability in relation to RIP or Minutes of Labour in Member States differed substantially from that of price, with both MPPC and *Marlboro* cigarettes being least affordable in Member States such as Romania, Hungary and Bulgaria with low absolute prices, as well as in those such as the UK, Ireland and France in which prices were high. Although Luxembourg was a far less extreme outlier for the Minutes of Labour measure, the four-fold range of Minutes of Labour affordability (and more for the GDP-based RIP measure) indicates that by both of these measures, price is being exploited to very different degrees as a tobacco control measure across Member States.

However the affordability of cigarettes in relation to the *Big Mac* prices revealed a different pattern. The *Big Mac* index affordability for MPPC cigarettes was lowest in the three highest tobacco price countries (UK, France and Ireland), and highest in low tobacco price countries including Latvia, Slovakia, Estonia and Lithuania, across a nearly seven-fold range. For *Marlboro*, *Big Mac* affordability varied less markedly in the countries for which data were available, across a three-fold range from the lowest affordability again in France, Ireland and the UK, to highest affordability in Eastern Europe. However the correlation between *Big Mac* affordability and cigarette prices indicate that to an extent, these consumer products are priced in relation to each other within countries, and hence either that the *Big Mac* index adds little further insight into cigarette

affordability, or that the retail pricing policy of both products is related to other and as yet unidentified local characteristics. This interpretation is supported by the fact that RIP and Minutes of Labour affordability measures, whilst correlated with each other, were unrelated to *Big Mac* affordability.

Only one of the measures which described relative price of cigarettes compared to the *Big Mac* hamburger appeared to be significantly correlated with cigarette prices indicating that in countries with lower cigarette prices they tend to be more affordable. In contrast, there was no correlation between RIP or number of minutes of labour necessary to purchase a pack of cigarettes and cigarette price, except one case when minutes of labour necessary to purchase one pack of Marlboro were calculated, and results suggested that in countries with cheaper Marlboro brand cigarettes they tend to be less affordable compared to the countries with relatively high cigarette prices.

Cigarette prices can be compared between countries in terms of the local price of a brand that is available (but not necessarily similarly popular) in each country, or the price of the most popular brands or brand categories in each country. The EU and WHO use the latter approach[387,388], and the ranking of Member States in relation to the respective measures they use (the MPPC and Most Sold categories) was very similar. Therefore MPPC cigarette prices were adopted for further analysis. The ranking of prices of *Marlboro*, a global cigarette brand that is widely available throughout the EU (though prices were available to us for only 21 Member States) was also similar to that of the MPPC but the range of prices was less, predominantly because of a higher minimum price, and the price ratio analysis indicates that this pricing structure makes Marlboro relatively unaffordable (and hence probably unpopular) in lower income countries. In general, cigarette prices were lowest in Eastern European Member States and highest in the UK, Ireland and France.

Measures of affordability express price in relation to income or purchasing power, for which a number of measures are also available. In this study two standard measures of income, the *per capita* GDP and hourly wages, were used which respectively reflect national income and average wages or salaries. Ranking of Member States for these two measures was very similar. However the exceptionally high GDP for Luxembourg, which is probably an artefact arising from a high population of cross-border workers, resulted in a higher range of measures for GDP and hence suggests that, as recommended by the WHO, the number of minutes of labour required to purchase a pack of cigarettes is probably the better of these two measures[396]. As a measure of disposable income purchasing power also the *Big Mac* index was used, which expresses the price of cigarettes in relation to that of a discretionary, relatively ubiquitous and low cost consumer item, the market price of which provides a simple reflection of competitive local production and labour costs and hence local disposable income purchasing power parity in different Member States and currencies[397].

6.4.2 Comparison with previous research

Affordability is not directly linked to human behaviour and cannot exactly predict changes in cigarette purchase when cigarette prices or income changes and also does not link to policy instruments as affordability cannot be regulated directly[398]. Blecher and van Walbeek have stated that prices might not be a good indicator of affordability[180] and considering cigarette prices but not affordability might not be appropriate for countries with rapid economic growth[177].

Previous studies on cigarette affordability have been mainly focused on comparisons between developed and developing countries and changes over time in each of these groups of countries[171,174,177,180]. Cigarette prices typically are higher in wealthier countries and countries with stronger tobacco control

policies[171]. However higher cigarette prices do not necessarily mean that cigarettes are less affordable[179] and even though cigarettes are much more expensive in wealthier countries, cigarettes also tend to be more affordable in high income countries (2-6 time more than in middle income countries and 12 time more compared to low income countries)[171,177]. Results from this study were in line with those previously published as in most cases there was no correlation between cigarette price and affordability. According to the World Bank, most current Member States are classified as high income countries (24 out of 27)[354]. The findings from this study indicate that where absolute prices are high, as in the UK, France and Ireland, affordability is relatively low by all of the measures we studied, but that in the lower price (and typically also relatively lower income) countries, particularly those in Eastern Europe, the relation between price and affordability is less consistent. In particular, Romania, Bulgaria and Hungary had some of the lowest affordability rankings for RIP and Minutes of Labour, whilst for *Big* Mac affordability, these countries ranked highly, behind the Baltic States (Lithuania, Latvia, Estonia) and Slovakia.

6.4.3 Strengths and limitations

The main strength of this study is the inclusion of a variety of affordability calculations to investigate affordability in a set of countries with broadly similar tobacco taxation policies. Several representative price categories and sources for income data were used to gain more comprehensive understanding of variation in cigarette affordability.

This study had several limitations. Firstly, as in some cases price or income data were available in some countries, it was not possible to estimate affordability for all current EU Member States. This is likely to have an impact on the analysis of relation between price and affordability and might result in incomplete

comparisons. However, as in most cases several ways of calculating each affordability measure were used revealing broadly similar results they can be regarded as comparable and representative.

In published sources *Marlboro* cigarette prices and net hourly wages were provided for capital cities of EU countries, and it is possible that these prices are not representative of those charged in other areas of those countries. Attempts were made to investigate whether inclusion of other cities in cases when such data were available would result in different results. *Marlboro* price data for Italy, Germany, UK, France, and Spain were available for two cities or more (five for Germany). However, in Spain and Italy there was no difference in cigarette price between the two cities, while in France, UK and Germany very little difference was found between prices. It therefore appears that the capital city prices are probably broadly representative of national prices.

The affordability measures used in this study use average income, and in countries with large income disparities, this might be a poor indicator of income among the lower socioeconomic groups among whom smoking tends to be more prevalent [382]. Alternatively, measuring affordability in relation to UBS Prices and Earnings Survey data of hourly wages may also be unrepresentative as this measure of income is based on the earnings of a narrow group 14 occupations selected to be representative to workforce in the manufacturing and service sectors. Average family size and unemployment are not considered when average wages are calculated[371]. Nonetheless, currently the UBS survey is the best available data source for hourly wages.

Additionally when the minutes of labour measure was calculated it was not possible to match the year for which price data were available (2008) with the one for income data (2009). Cigarette price and income changes may have

occurred between these two years, though the scale of any such change is perhaps unlikely to be substantial.

When comparing affordability across countries, the currency used for cigarette prices and incomes is likely to be affected by changes in exchange rates over time. As in most cases we used income and price data provided in Euros or converted them into Euros, differences in exchange rates are likely to affect the accuracy of data for some countries. However, currently the Euro is a national currency for 15 of the 27 EU countries, thus this problem will only affect 12 EU countries.

6.4.4 Conclusions

Affordability, which takes into account prices and income, is more appropriate for international comparisons and evaluation of success of tobacco control policy than absolute cigarette prices. Affordability rather than absolute price is also a better measure for monitoring cigarette prices over time as both income and prices change along with a country's economic development, however to a different extent. Comparing affordability between countries with different cultures, economies, educational opportunities, costs of living and many other characteristics is difficult, as choices on discretionary spending, and pressures on individual and family budgets, are likely to vary markedly.

Currently, there are minimum requirements for excise duty levied on cigarettes in the EU countries (57% of retail selling price but not less than 64 Euros per 1000 cigarettes). However, other taxes and the structure of excise duty (the proportion of specific and ad valorem tax) vary between Member States[268,376]. Although fiscal policies and other tobacco control policies in the EU are harmonised to some extent by minimum requirements, as are policies such as the advertising ban[399], findings from this study suggest that cigarette prices

along with income vary widely across the EU independently of which measures are used resulting in a large variation in cigarette affordability between Member States. Price rises using taxation, particularly in the Eastern European countries that have recently joined the EU and were experiencing rapid economic development, are required to achieve comparable affordability.

The overall conclusion of the study is that cigarette price could be used far more effectively as a tobacco control measure across the EU, and would be likely to help to reduce substantially the current marked difference in smoking prevalence across EU Member States.

Chapter 7 Changes in cigarette price and affordability in the European Union

7.1 Introduction

As discussed in the previous chapter, tobacco prices increases are a highly effective means of reducing tobacco consumption and smoking prevalence, and hence a crucially important tobacco control measure. The findings in the previous chapter also demonstrate marked variations in the affordability of cigarettes in the EU, raising the possibility that more use could be made of price increases, typically achieved through increases in excise duty, to reduce smoking prevalence across Europe.

7.1.1 Cigarette affordability in old and new EU Member States

In the EU, there are minimum requirements for excise duty but the structure of excise tax in terms of proportional and specific tax varies between countries. Since 2004 12 new countries have joined the EU, and have therefore had to adapt national legislation to meet minimum taxation requirements on cigarettes. However it is not clear whether the adoption of the EU tax policy has had an impact on smoking prevalence in these 12 Member States. Also, these and older EU Member States have changed the structure and amount of excise tax levied on cigarettes, but to different extents and with different pace of change. Previous comparisons of cigarette prices between EU Member States have adjusted for national income[274,385] or the purchasing power of currencies[386], but changes in price, tax and affordability over time, and hence the extent to which cigarette affordability is being used as a tobacco control measure, have not been comprehensively compared.

7.1.2 Aim of the chapter

The aim of this chapter was therefore to explore the extent to which EU Member States are using taxation to reduce cigarette affordability, and the impact of this

policy on smoking prevalence, by comparing current levels and recent changes in the average number of minutes of labour required to earn a pack of 20 cigarettes, and in smoking prevalence, in the current 27 EU Member States.

7.2 Methods

As described in Chapter 6, a previous study established that the *Big Mac* index was prone to distortion by relatively high *Big Mac* prices in former Eastern European countries. Therefore the average number of minutes of labour required to earn the price of 20 cigarettes and relative income price (RIP) were used as measures of national cigarette affordability for the present study. Since data on net hourly wages are published at three-year intervals (most recently in 2003, 2006 and 2009) data on cigarette prices, tax levels and smoking prevalence were matched for these years, substituting any missing data with figures from the closest available year. The final dataset thus provided at least one affordability estimate before and after accession for each of the countries that joined the EU in 2004 and 2007, and prevalence data for all countries for 2006 and 2009.

7.2.1 Cigarette prices

The Most Popular Price Category (MPPC) cigarette price data published by the European Commission as the price of 1000 MPPC cigarettes, in Euros and national currency, for all current EU Member States were used. In 2003 data for the 15 EU Member States at that time (*old Member States* - Austria (AT), Belgium (BE), Germany (DE), Denmark (DK), Greece (EL), Spain (ES), Finland (FI), France (FR), United Kingdom (UK), Ireland (IE), Italy (IT), Luxembourg (LU), the Netherlands (NL), Portugal (PT), and Sweden (SE)) - were published in April/May. MPPC data were also published in July 2003 for 11 of the 12 countries that joined the EU (*new Member States*) in 2004 (Cyprus (CY), Czech Republic (CZ), Estonia (EE), Lithuania (LT), Latvia (LV), Malta (MT), Poland (PL), Slovenia (SI) and Slovakia (SK)) and 2007 (Romania (RO) and Bulgaria (BG))[400,401]; price data for Hungary (HU) were not provided until 2004[402]. For Bulgaria and Latvia, in 2003 data for filtered and un-filtered cigarettes were available, and for

analysis we used filtered cigarette prices. In 2006 and 2009 data were published twice each year, in January and July, and for analysis July data were used[321,403]. For Malta in 2006 data were available for 'king size' and 'small size' cigarettes, and differed slightly; the 'king size' estimates were included in analysis.

7.2.2 Income

Net hourly wages

Personal income in Member States were estimated from average hourly wage data for a sample of occupations, net of tax and social security contributions, provided in US dollars by the Union Bank of Switzerland (UBS) 'Prices and Earnings Survey' for capital cities of all Member States (except Cyprus in 2003, and Malta in all three study years)[379,393,404]. For 2003, wage data were available for 13 occupations representing a cross-section of the workforce in industrial and service sectors (product manager, department head, engineer, primary school teacher, bus driver, car mechanic, building labourer, skilled industrial worker, cook, bank credits clerk, personal assistant, female sales assistant, female factory worker)[379], while in 2006 and 2009, wage data were provided for 14 occupations which included the same 13 occupations as in previous years and one additional occupation (call centre agent)[393,404]. Net hourly wages were converted into Euros using the currency exchange rates cited in the reports. Income data were not available for Malta.

The relation between hourly wages and personal disposable income in Euros per inhabitant for the two years (2003 and 2006) for which both were available was also explored[405]. Personal disposable income is gross income less direct tax and social security contributions and represents actual income available for spending[406] and is similar to net hourly wages estimates. As personal disposable income were provided by Eurostat at national level it is more likely to reflect average income for wider population not just a group of professions.

Per capita GDP

Average income at national level were measured using *per capita* GDP data in current prices, in Euros, obtained from the Eurostat database[394] for the years 2003, 2006 and 2009. Data for Bulgaria for the year 2009 were not available therefore were substituted with those from the year 2008.

7.2.3 Affordability

Minutes of Labour affordability

The number of minutes of labour required to purchase 20 MPPC cigarettes[174,396] was estimated by dividing cigarette prices by net average wage rates for each Member State. MPPC cigarette prices are reported for 1000 cigarettes, which was assumed to be the equivalent of 50 packs of 20 cigarettes.

Relative income price

The Relative income price (RIP)[171] was calculated as the proportion of *per capita* GDP necessary to buy 100 packs of cigarettes. RIP estimates for MPPC cigarettes for all 27 Member States for the years 2003, 2006 and 2009 were generated.

7.2.4 Tax

Data on tax yield in Euros per 1000 cigarettes were obtained from the same sources as MPPC cigarette prices[321,400-403]. Total tax was expressed as the sum of specific excise tax, *ad valorem* excise tax and value added tax in Euros per pack (total tax yield), and as the proportion of the retail price (total tax incidence) attributable to tax for 20 cigarettes.

7.2.5 Smoking prevalence

Smoking prevalence data for the 27 EU Member States were obtained from Eurobarometer surveys of national samples of around 1,000 respondents (500 in smaller Member States) aged 15 years and older in 2006 and 2009[23,286]. Data were not available for 2003.

7.2.6 Unemployment

To take into account any effect of economic recession in 2008 and 2009 data on annual average unemployment rate for 2006 and 2009 from the Eurostat database[407] were used to adjust the effect of change in affordability on change in smoking prevalence.

7.2.7 Statistical analysis

SPSS v.17 was used to generate parametric descriptive statistics, using arithmetic means, to estimate changes from 2003 to 2009, and compare differences between old and new Member States. Univariate associations between changes in affordability, tax and smoking prevalence was measured using Spearman Rank correlation (non-parametric methods were used to provide more conservative estimates of correlation between changes in these variables), and partial correlations after adjustment for change in unemployment (as a marker of recession) between 2006 and 2009, and Tobacco Control Scale scores (as a marker of other tobacco control policy change). Differences between old and new EU countries were estimated using t-test for independent samples or the Mann-Whitney U test in cases when variables were not normally distributed.

7.3 Results

7.3.1 Cigarette prices

The mean price of 20 MPPC cigarettes in 2009 was 3.55 (SD 1.7) Euros and varied six-fold across the EU, from 1.48 Euros in Bulgaria to 8.45 Euros in Ireland (Figure 7.1).

Prices were significantly ($p<0.01$) lower in the new Member States in all years but rose progressively between 2003 and 2009 in all Member States, by a mean (SD) of 1.1 (0.65) Euros, ranging from 0.2 Euros in the UK to 3.45 Euros in Ireland (Figure 7.1,Table 7.1); however there was no statistically significant difference in this change between old (1.23 Euros (SD 0.83)) and new (0.97 Euros (SD 0.27)) Member States ($p=0.31$).

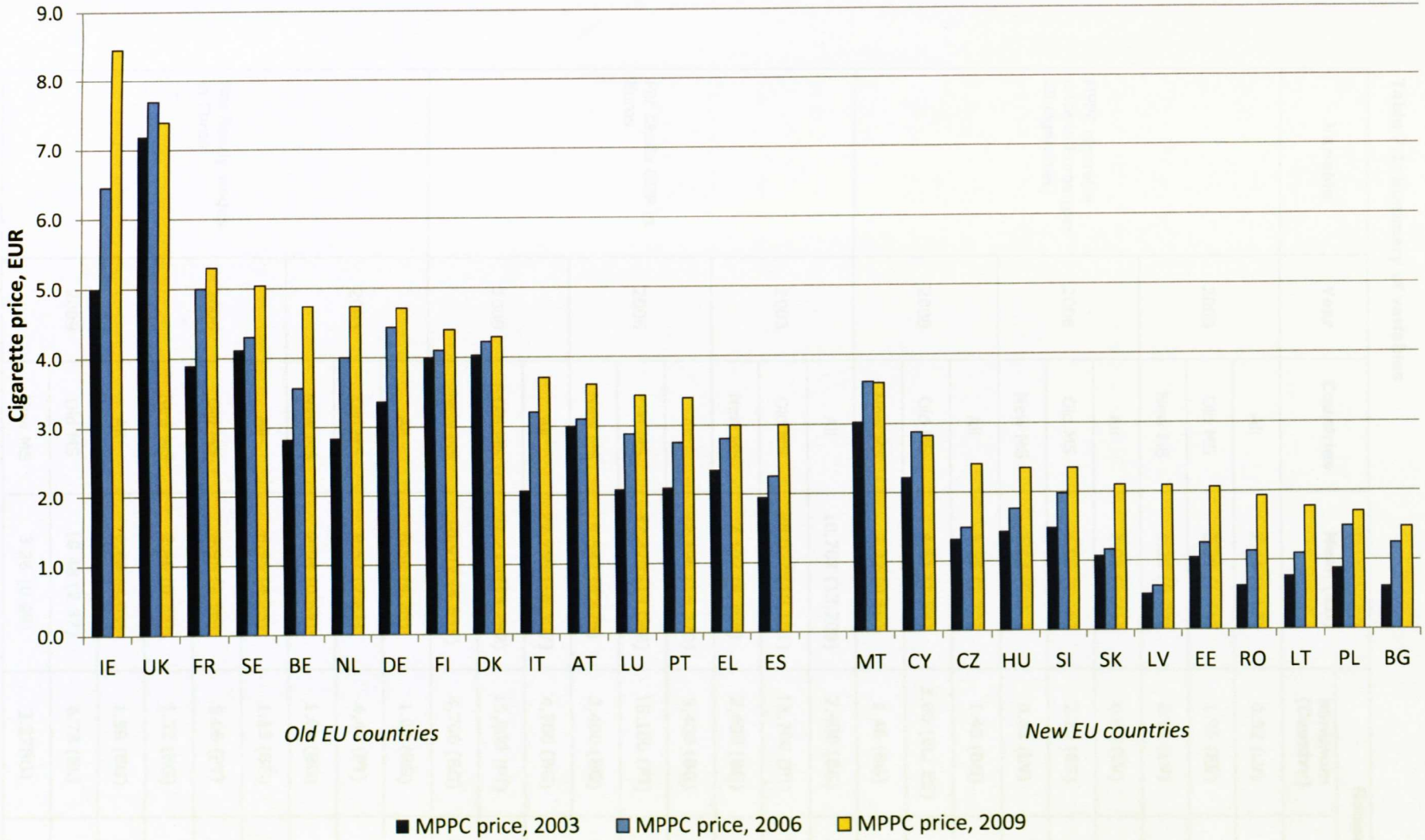

Figure 7.1: MPPC cigarette prices for 2003, 2006 and 2009 in old and new EU Member States (ranked by 2009 data)

Table 7.1: Summary of variables

Variable	Year	Countries	Mean (SD)	Range	
				Minimum (Country)	Maximum (Country)
MPPC cigarette price in Euros (per 20 cigarettes)	2003	All	2.44 (1.57)	0.52 (LV)	7.19 (UK)
		Old MS	3.39 (1.41)	1.95 (ES)	7.19 (UK)
		New MS	1.25 (0.73)	0.52 (LV)	3.03 (MT)
	2006	All	2.98 (1.71)	0.63 (LV)	7.69 (UK)
		Old MS	4.05 (1.46)	2.25 (ES)	7.69 (UK)
		New MS	1.64 (0.84)	0.63 (LV)	3.61 (MT)
	2009	All	3.55 (1.70)	1.48 (BG)	8.45 (IE)
		Old MS	4.61 (1.54)	3.00 (EL; ES)	8.45 (IE)
		New MS	2.22 (0.56)	1.48 (BG)	3.59 (MT)
Per capita GDP in Euros	2003	All	18,767 (13,209)	2,400 (BG)	57,200 (LU)
		Old MS	28,027 (10,151)	13,700 (PT)	57,200 (LU)
		New MS	7,192 (4,260)	2,400 (BG)	16,300 (CY)
	2006	All	22,196 (15,270)	3,400 (BG)	71,800 (LU)
		Old MS	32,320 (13,048)	15,100 (PT)	71,800 (LU)
		New MS	9,542 (4,476)	3,400 (BG)	19,000 (CY)
	2009	All	22,759 (15,107)	4,700 (BG)	76,500 (LU)
		Old MS	32,233 (13,752)	15,800 (PT)	76,500 (LU)
		New MS	10,917 (4,835)	4,700 (BG)	21,200 (CY)
Net hourly wages in Euros	2003	All	6.56 (4.28)	1.03 (BG)	13.61 (LU)
		Old MS	9.57 (2.61)	4.47 (PT)	13.61 (LU)
		New MS	2.04 (0.64)	1.03 (BG)	3.17 (SI)
	2006	All	6.95 (4.25)	1.33 (BG)	13.68 (IE)
		Old MS	9.95 (2.56)	5.06 (PT)	13.68 (IE)
		New MS	2.46 (0.75)	1.33 (BG)	3.72 (SI)
	2009	All	7.68 (4.03)	1.99 (BG)	14.31 (IE)
		Old MS	10.48 (2.37)	6.73 (EL)	14.31 (IE)
		New MS	3.26 (0.99)	3.27BG)	5.20 (SI)

7.3.2 Income

In 2009 the mean (SD) national net hourly wage in the EU was 7.68 (4.03) Euros, ranging from 1.99 Euros in Bulgaria to 14.31 Euros in Ireland (Figure 7.2).

Net hourly wages were significantly lower in the new Member States in all years (all $p<0.01$) and increased between 2003 and 2009 in all new Member States but not in all of the old; the mean (SD) overall change was an increase of 1.03 (0.89) Euros, ranging from a 0.64 Euro decrease in the UK to an increase of 2.64 Euros in Portugal (Figure 7.2; Table 7.1). The increase was greater, but not significantly so ($p=0.36$), in new (1.22 Euros (SD 0.73)) than in old Member States (0.9 Euros (SD 0.98)). Although the difference between old and new Member States was not significant, relative changes were much greater in new EU Member States. Personal disposable income was strongly correlated with net hourly wages in the two years for which data on the latter were available (Pearson's $R= 0.95$; $p<0.01$ for 2003 and $R=0.96$; $p<0.01$ for 2006).

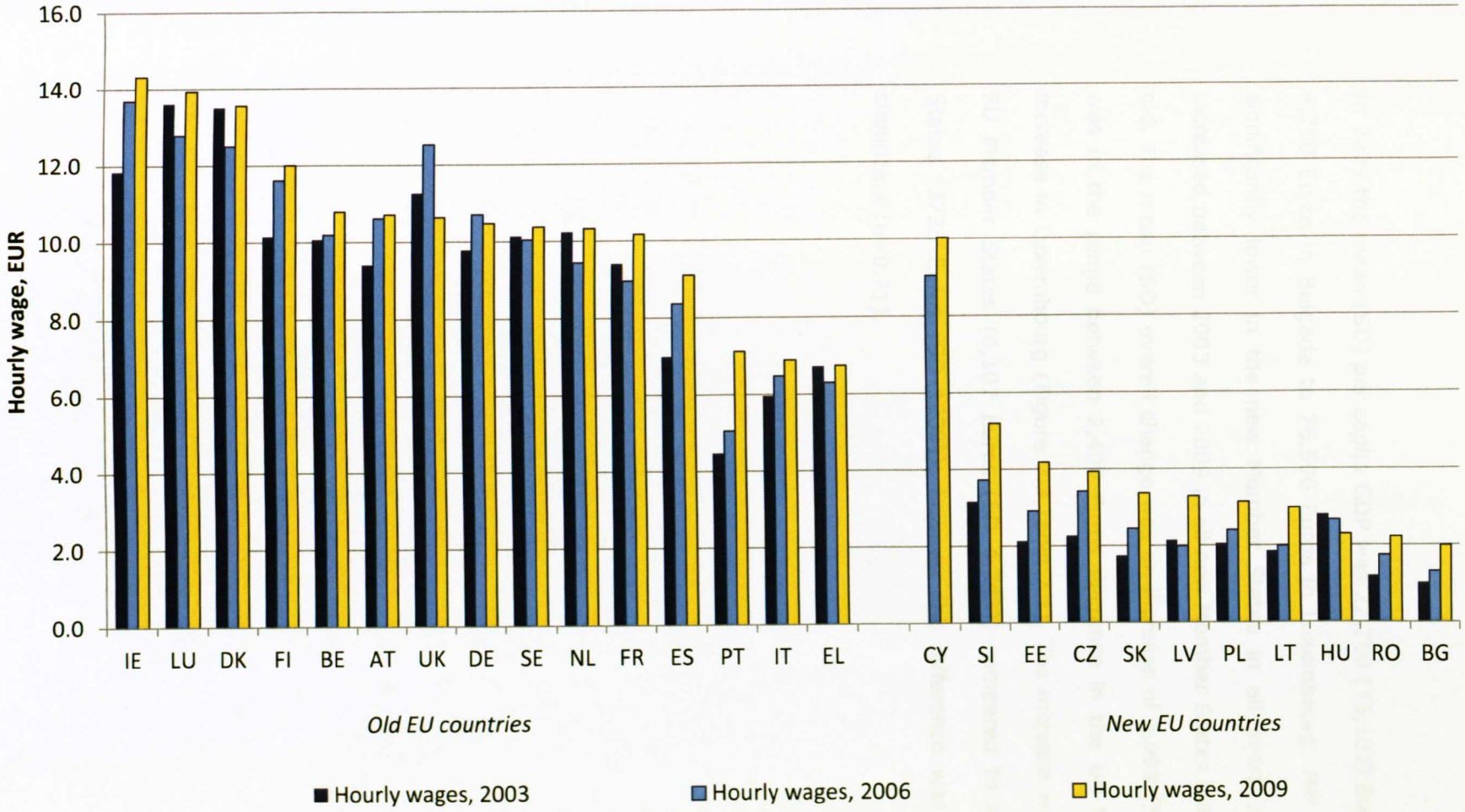

Figure 7.2: Net hourly wages in Euros for 2003, 2006 and 2009 in old and new Member States (ranked by 2009 data)

In 2009 the mean (SD) *per capita* GDP was 22,759 (15,107) Euros ranging from 4,700 Euros in Bulgaria to 76,500 Euros in Luxembourg. *Per capita* GDP was significantly lower in the new Member States in all years (all $p<0.01$) and increased between 2003 and 2009 in all new Member States but not in all of the old. The mean (SD) overall change was an increase of 3,993 (3,581) Euros and was in the range between 2,400 Euros decrease in the UK to 19,300 Euros increase in Luxembourg (Figure 7.3,Table 7.1). The increase was greater in old EU Member States (4,107 Euros (SD 4,743)) compared to new EU Member States (3725 Euros (SD 1239)); however the difference was not statistically significant ($p=0.71$).

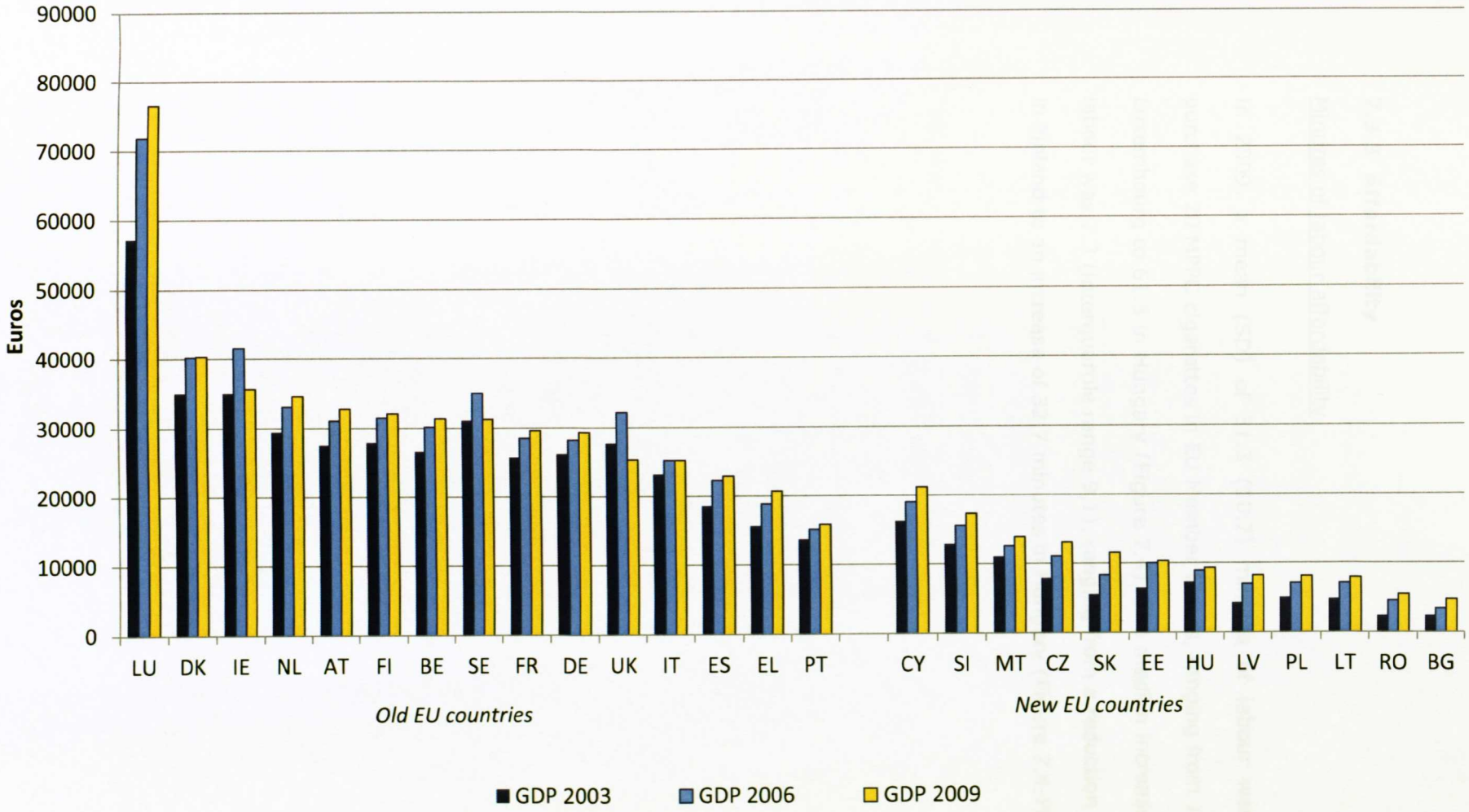

Figure 7.3: *Per capita* GDP in Euros for 2003, 2006 and 2009 in old and new Member States (ranked by 2009 data)

7.3.3 Affordability

Minutes of labour affordability

In 2009, a mean (SD) of 31.3 (10.7) minutes of labour were required to purchase 20 MPPC cigarettes in EU Member States, ranging from 14.8 minutes in Luxembourg to 61.5 in Hungary (Figure 7.4). The median increase in minutes of labour was 7.2 (interquartile range 9.1), ranging from a reduction of 0.1 minutes in Finland to an increase of 32.7 minutes in Hungary (Figure 7.4-Figure 7.5).

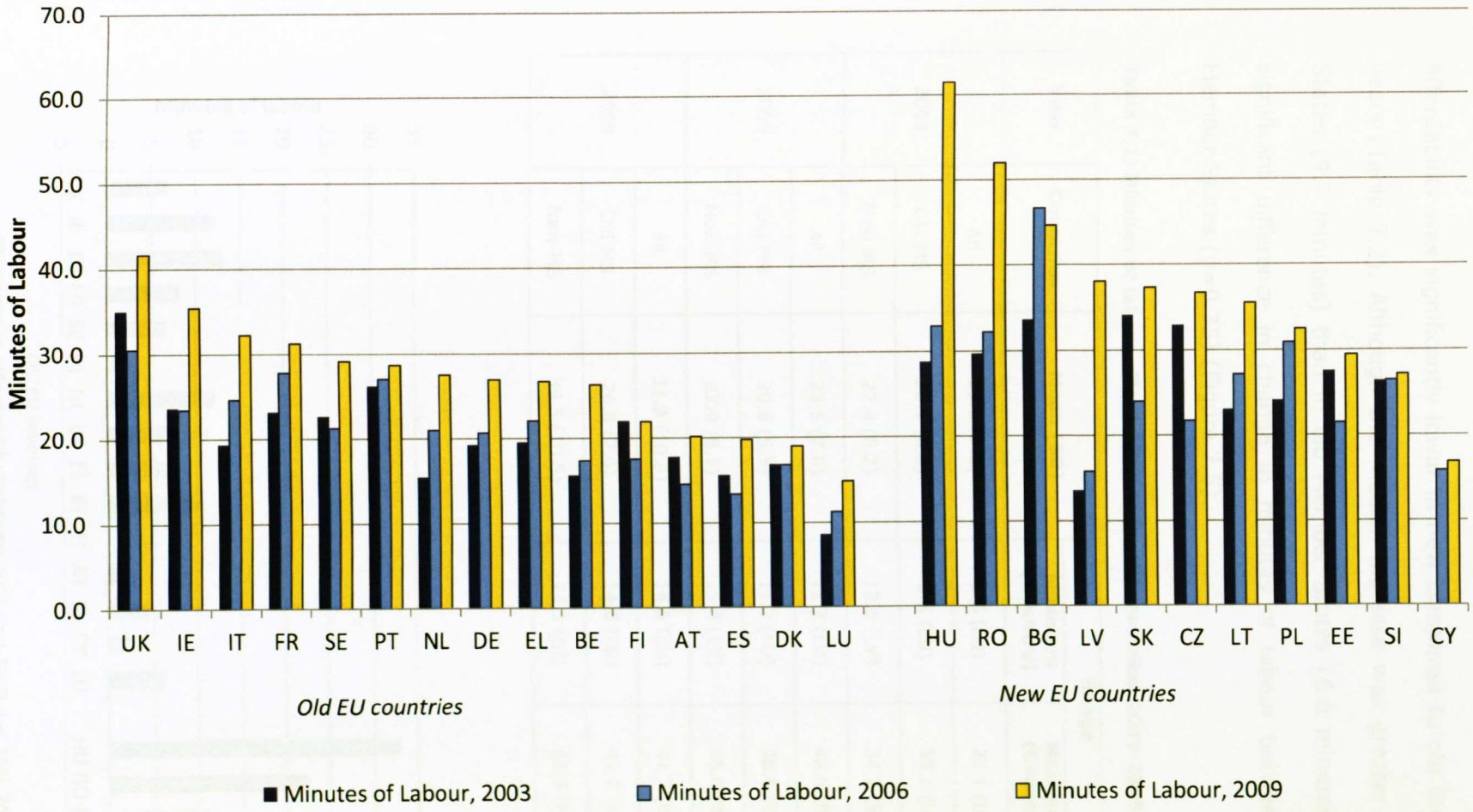

Figure 7.4: Minutes of Labour affordability of MPPC cigarettes in 2003, 2006 and 2009 in new and old Member States (ranked by 2009 affordability)

Affordability was significantly lower in new compared to old EU countries in all years (Table 7.2). Although the median increase was greater in new Member States (9.7 minutes) than in old Member States (6.6 minutes) there was no significant difference in change in minutes of labour between old and new Member States (p=0.35) (Figure 7.5).

Table 7.2: Minutes of labour affordability in the EU countries, 2003-2009

Year	Countries	Mean (SD)	Range	
			Minimum (Country)	Maximum (Country)
2003	All	23.0 (7.0)	8.6 (LU)	35.1 (UK)
	Old MS	20.1 (6.0)	8.6 (LU)	35.1 (UK)
	New MS	27.4 (6.2)	13.6 (LV)	34.1 (SK)
2006	All	23.5 (7.6)	11.2 (LU)	46.6 (BG)
	Old MS	20.6 (5.5)	11.2 (LU)	30.6 (UK)
	New MS	27.9 (8.5)	15.8 (LV)	46.6 (BG)
2009	All	31.9 (10.5)	14.8 (LU)	41.7 (UK)
	Old MS	26.8 (7.0)	14.8 (LU)	41.7 (UK)
	New MS	39.5 (10.5)	27.1 (SI)	61.5 (HU)

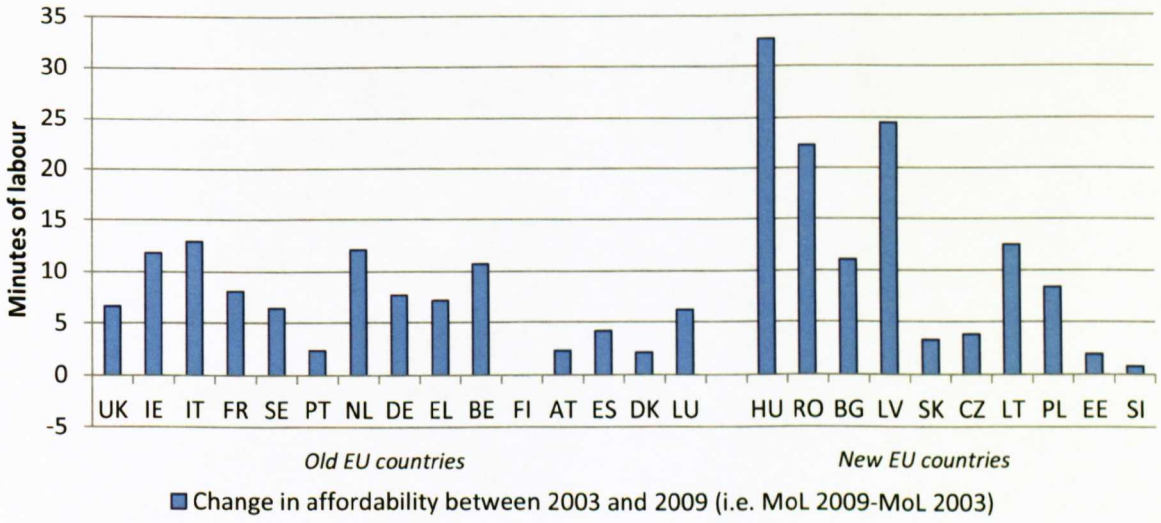

Figure 7.5: Change in cigarette affordability (measured in minutes of labour) between 2003 and 2009

Cigarette affordability was not significantly correlated with absolute price in any year, but change in affordability between 2003 and 2009 was more strongly correlated with change in price (R=0.48; p=0.02) than in hourly wages (R=-0.36; p=0.07).

RIP affordability

In 2009 an average of 1.87% (SD 0.70) of *per capita* GDP was required to purchase 100 packs of cigarettes ranging from 0.45% in Luxembourg (highest affordability) to 3.57% in Romania (lowest affordability) (Figure 7.6).

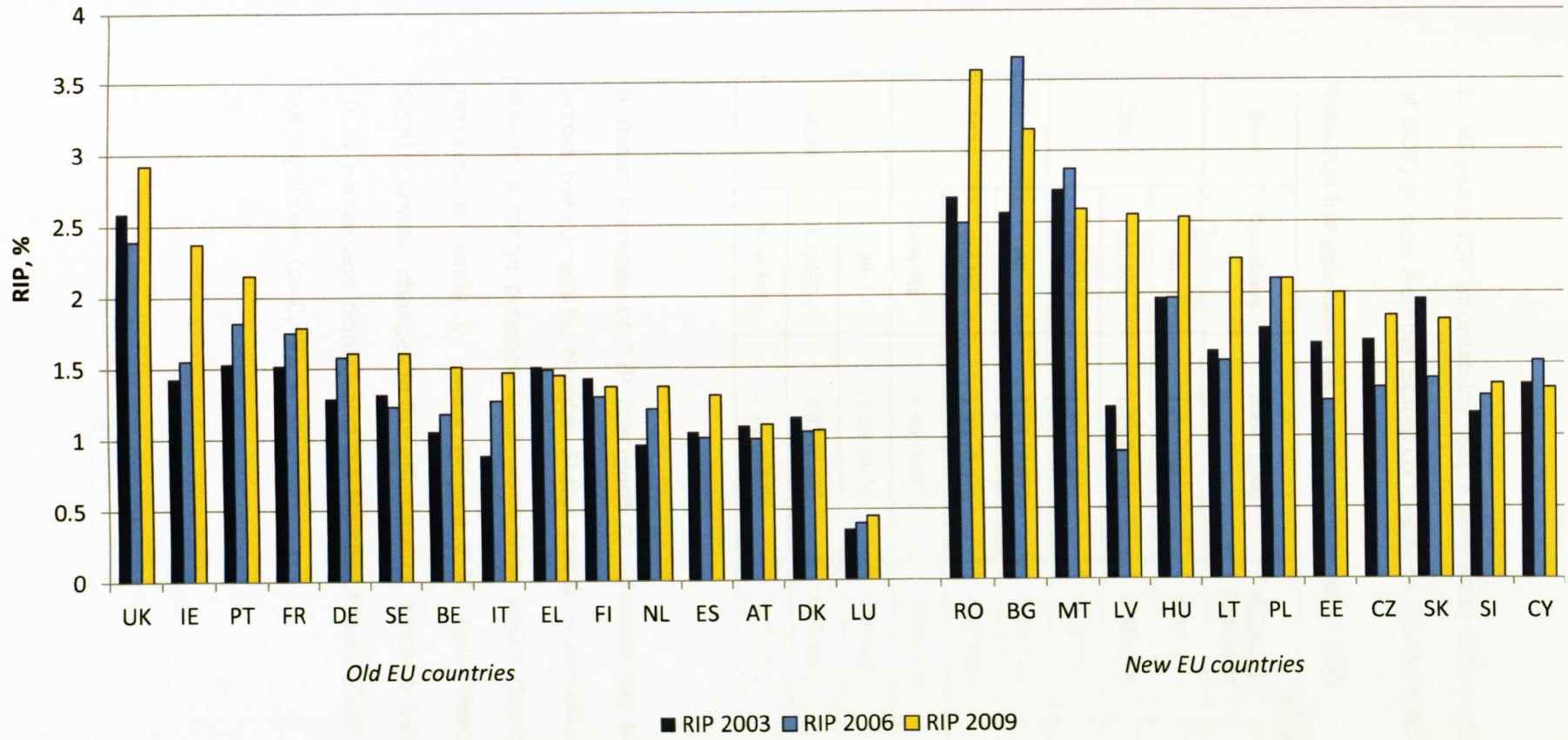

Figure 7.6: RIP affordability of MPPC cigarettes in 2003, 2006 and 2009 in new and old Member States (ranked by 2009 affordability)

In all years RIP affordability was significantly lower (characterized by higher % of GDP) in new Member States compared to old Member States (Table 7.3).

Table 7.3: RIP affordability in the EU countries, 2003-2009

Year	Countries	Mean (SD)	Range	
			Minimum (Country)	Maximum (Country)
2003	All	1.54 (0.58)	0.36 (LU)	2.73 (MT)
	Old MS	1.28 (0.48)	0.36 (LU)	2.59 (UK)
	New MS	1.86 (0.55)	1.16 (SI)	2.73 (MT)
2006	All	1.58 (0.67)	0.40 (LU)	3.66 (BG)
	Old MS	1.35 (0.45)	0.40 (LU)	2.39 (UK)
	New MS	1.86 (0.80)	0.90 (LV)	3.66 (BG)
2009	All	1.87 (0.7)	0.45 (LU)	3.57 (RO)
	Old MS	1.57 (0.58)	0.45 (LU)	2.92 (UK)
	New MS	2.25 (0.67)	1.33 (CY)	3.57 (RO)

A mean increase of RIP (decrease of affordability) between 2003 and 2009 across the current EU Member States was 0.34 percentage points (SD 0.36) and was in a range between 0.16 percentage points decrease in Slovakia to 1.33 percentage points in Latvia (Figure 7.7). New Member States experienced slightly greater changes in RIP affordability, however the difference between new (0.39 percentage points) and old Member States (0.29 percentage points) was not significant (p=0.49).

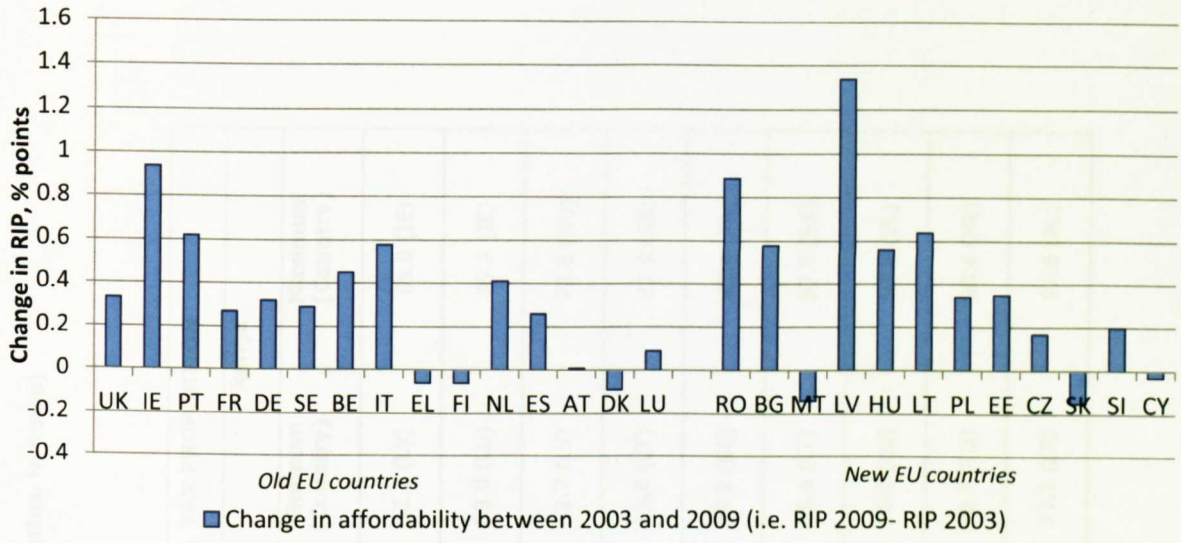

Figure 7.7: Change in cigarette affordability (measured in RIP) between 2003 and 2009

As both affordability measures revealed broadly similar results in term of country ranking and changes in affordability Minutes of Labour affordability measure only was selected for further analysis.

7.3.4 Tax

The mean (SD) total tax per 20 cigarettes in the EU in 2009 was 2.72 (1.29) Euros, and constituted a mean of 77.6% (SD 5.8%) of the retail price. The total tax yield was significantly higher ($p<0.01$) in old than in new Member States in all years (Figure 7.8,Table 7.4).

Table 7.4: Overall tax yield and tax proportion of cigarette price in the EU countries, 2003-2009 (per 20 cigarettes, in Euros)

		TOTAL TAX YIELD			TOTAL TAX PROPORTION		
Year	Countries	Mean (SD)	Range		Mean (SD)	Range	
			Minimum (Country)	Maximum (Country)		Minimum (Country)	Maximum (Country)
2003	All	1.82 (1.29)	0.27 (LV)	5.74 (UK)	71.1 (8.0)	52.7 (LV)	85.8 (IE)
	Old MS	2.59 (1.19)	1.40 (ES)	5.74 (UK)	75.5 (4.4)	69.0 (LU)	85.8 (IE)
	New MS	0.85 (0.57)	0.27 (LV)	2.19 (MT)	65.6 (8.2)	52.7 (LV)	78.3 (HU)
2006	All	2.24 (1.29)	0.41 (LV)	5.93 (UK)	74.2 (5.6)	55.6 (LT)	87.9 (SK)
	Old MS	3.05 (1.15)	1.76 (ES)	5.93 (UK)	75.2 (3.0)	69.2 (SE)	80.4 (FR)
	New MS	1.21 (0.65)	0.41 (LV)	2.75 (MT)	73.0 (7.7)	55.6 (LT)	87.9 (SK)
2009	All	2.73 (1.29)	1.27 (BG)	6.71 (IE)	77.6 (5.8)	70.7 (LU)	97.6 (PL)
	Old MS	3.50 (1.24)	2.20 (EL)	6.71 (IE)	75.6 (2.7)	70.7 (LU)	80.4 (FR)
	New MS	1.76 (0.39)	1.27 (BG)	2.74 (MT)	80.2 (7.6)	72.1 (LT)	97.6 (PL)

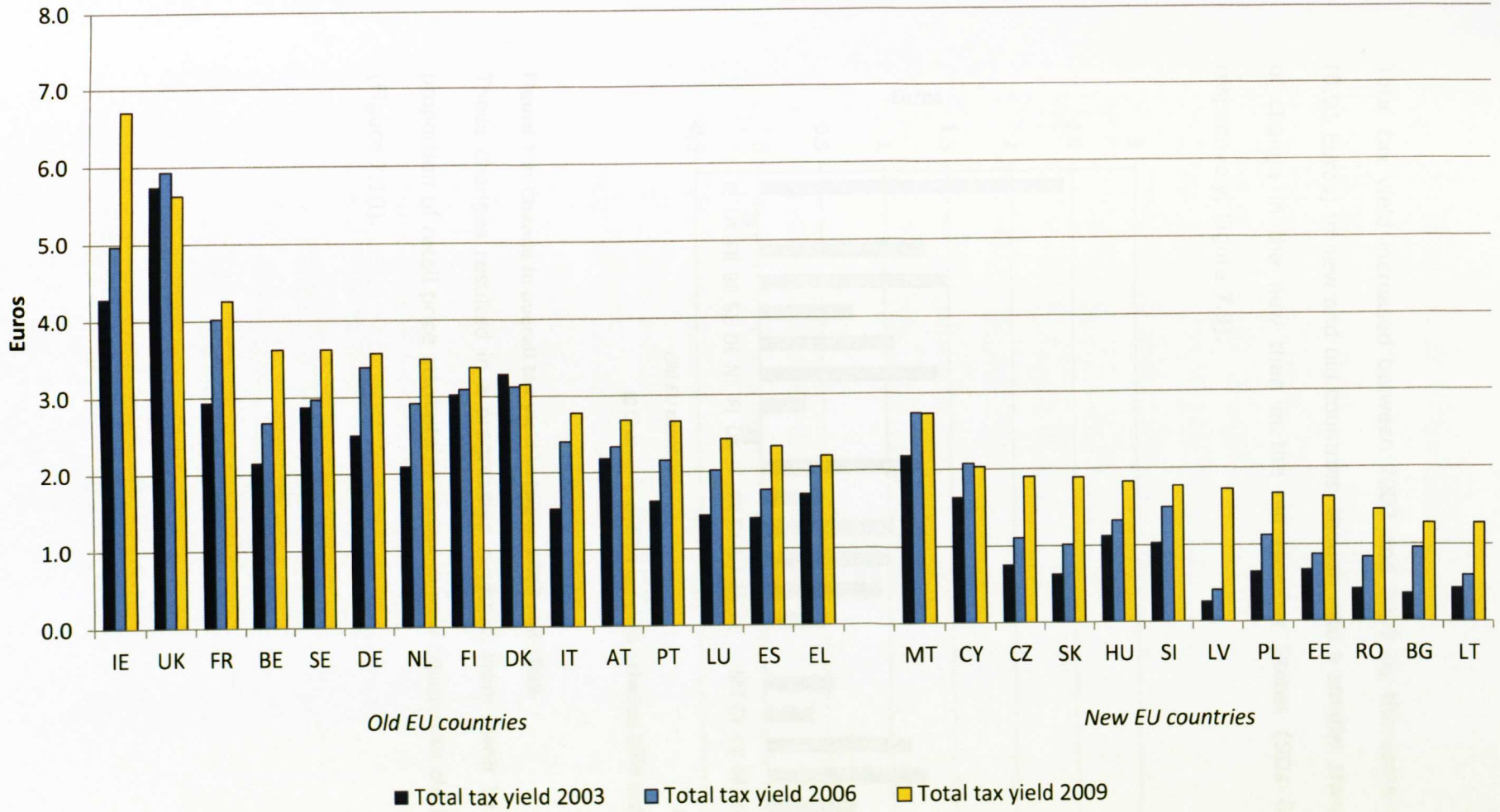

Figure 7.8: Total tax yield (Euros) by Member States, 2003, 2006 and 2009 (ranked by overall tax yield in 2009)

Total tax yield increased between 2003 and 2009 by the same mean amount (0.91 Euros) in new and old countries, though with a smaller standard deviation of change in the new than in the old Member States (SDs 0.29 and 0.65 respectively, Figure 7.9).

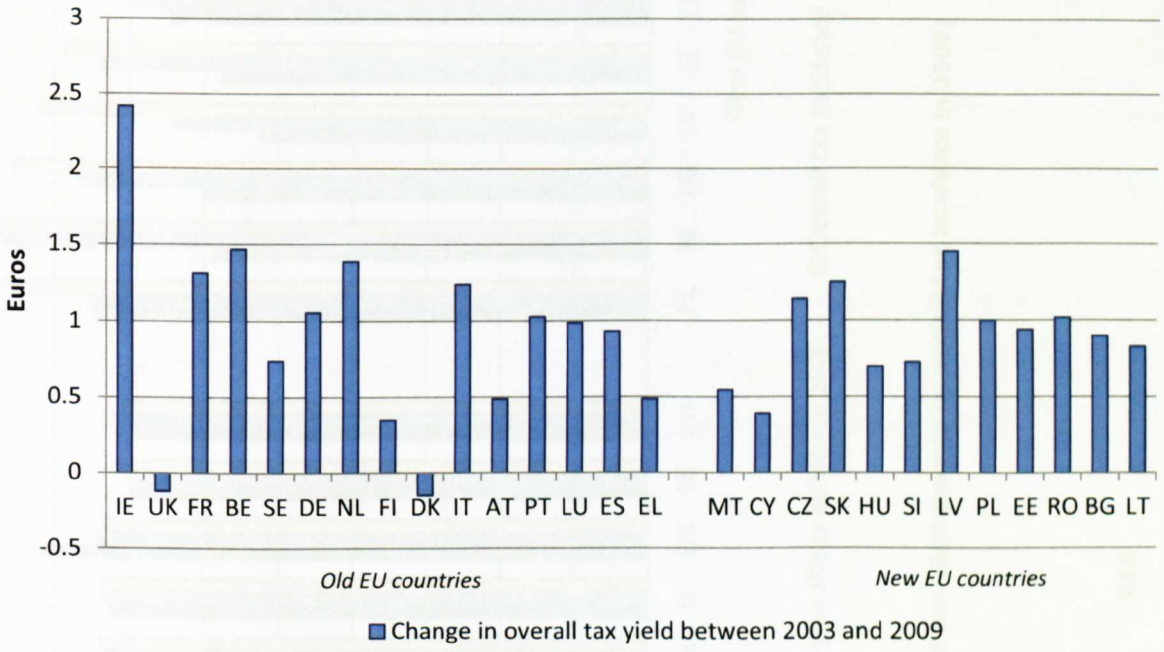

Figure 7.9: Change in overall tax yield between 2003 and 2009

These changes resulted in a progressive reversal, from lower to higher, of the proportion of retail price attributable to tax in new relative to old Member States (Figure 7.10).

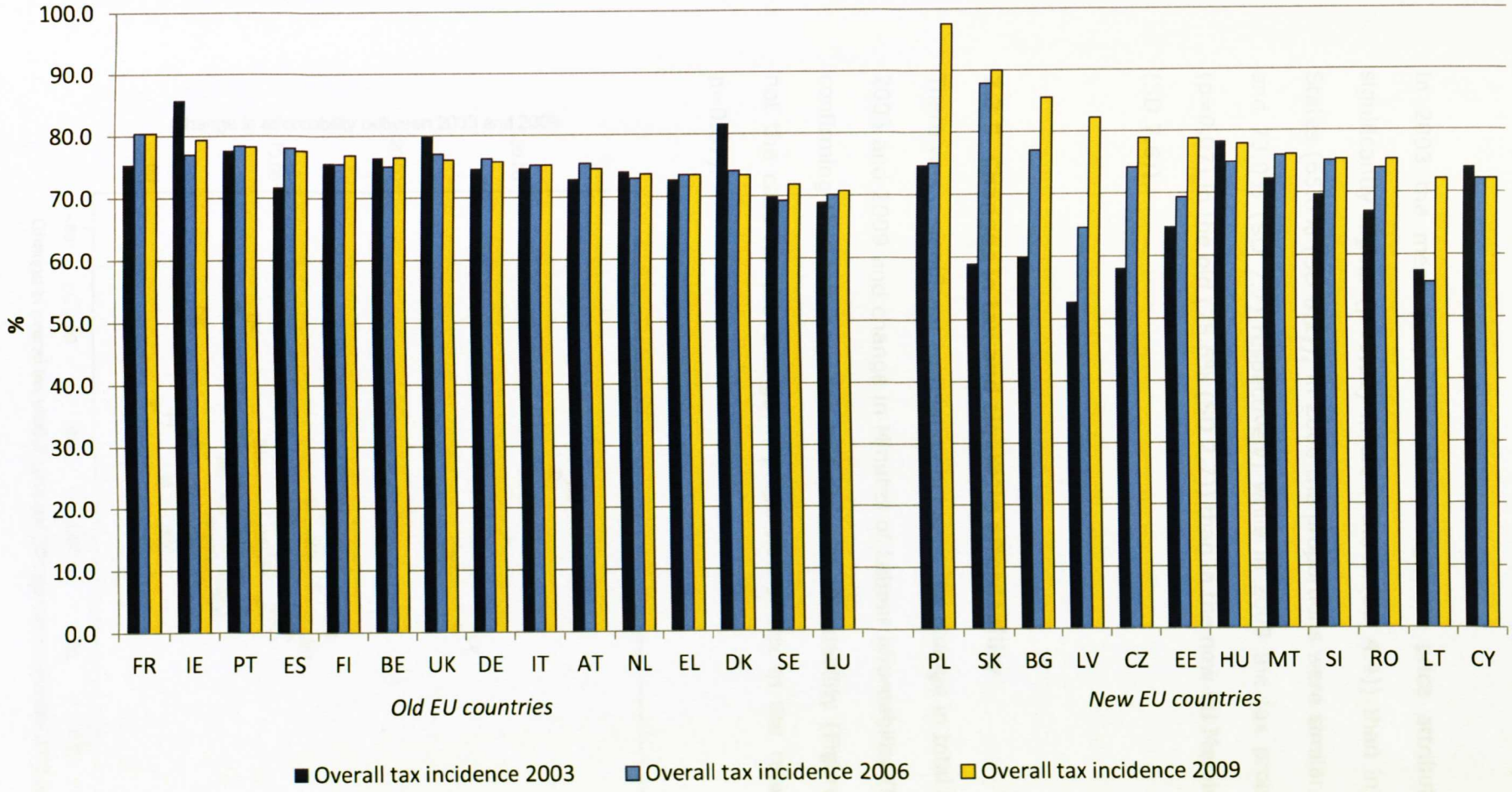

Figure 7.10: Total tax incidence (%) by Member States, 2003, 2006 and 2009 (ranked by overall tax incidence in 2009)

In 2003 the mean proportion of the cigarette price attributable to tax was significantly higher ($p<0.01$) in old (75.5% (SD 4.4)) than in new EU Member States (65.6% (SD 8.2)); in 2006 the proportions were similar (75.2% (SD 3.0) and 73.0% (SD 7.7) respectively) while in 2009 the tax proportion was lower ($p=0.07$) in the old (75.6% (SD 2.7)) than in the new EU Member States (80.2% (SD 7.6)).

7.3.5 Changes in tax and cigarette affordability

There was a significant correlation between the change in total tax yield between 2003 and 2009 and change in Minutes of Labour affordability ($R=0.44$; $p=0.03$), confirming that tax increases had reduced affordability (Figure 7.11). This was not the case for the change in proportion of tax in the retail price ($R=0.04$; $p=0.87$).

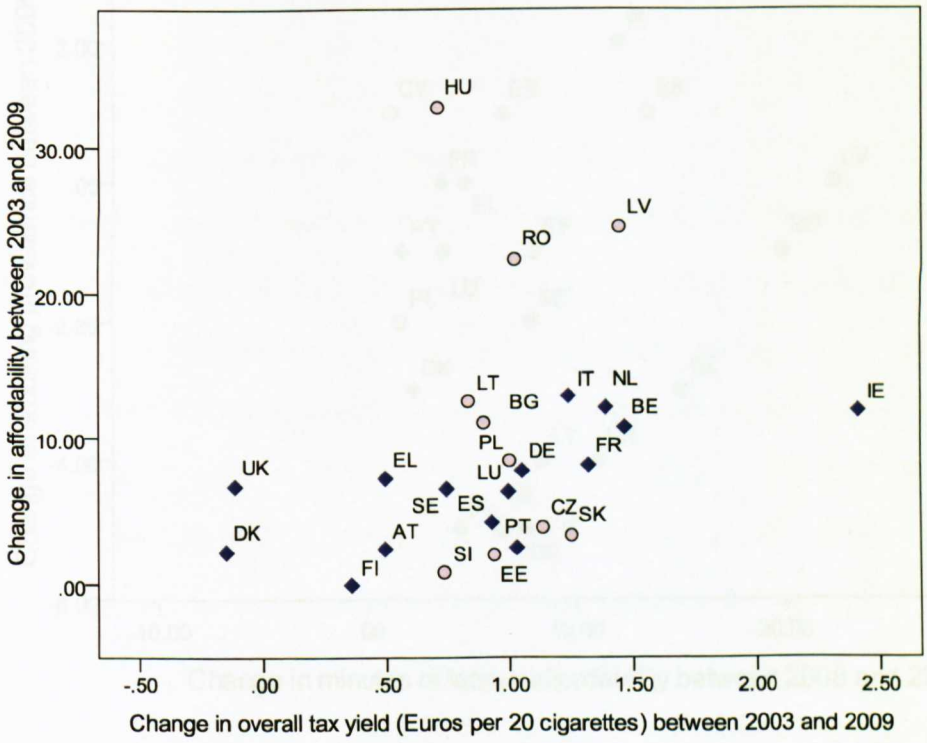

Figure 7.11: Correlation between changes in cigarette affordability and changes in overall tax yield between 2003 and 2009 (circles- new Member States; diamonds- old Member States)

7.3.6 Changes in affordability and changes in prevalence

The mean prevalence of smoking in the EU in 2006 was 30.3% (SD 5.1), ranging from 18% in Sweden to 42% in Greece. Smoking prevalence was slightly lower in old (29.5%; SD 5.4) than in new EU countries (31.2%; SD 4.7), but not significantly so. In 2009, mean smoking prevalence had fallen to 29.5% (SD 5.8), and had fallen more (though not significantly so) in the old (to 28.1%; SD 6.4) than the new countries (to 31.2%; SD 4.7). There was no correlation (R=-0.06; p=0.77) between changes in cigarette affordability and changes in prevalence (Figure 7.12), either before or after adjustment for change in unemployment rates (partial correlation: R=0.02; p=0.91) or adjustment for Tobacco Control Scale scores (partial correlation: R=0.05; p=0.82).

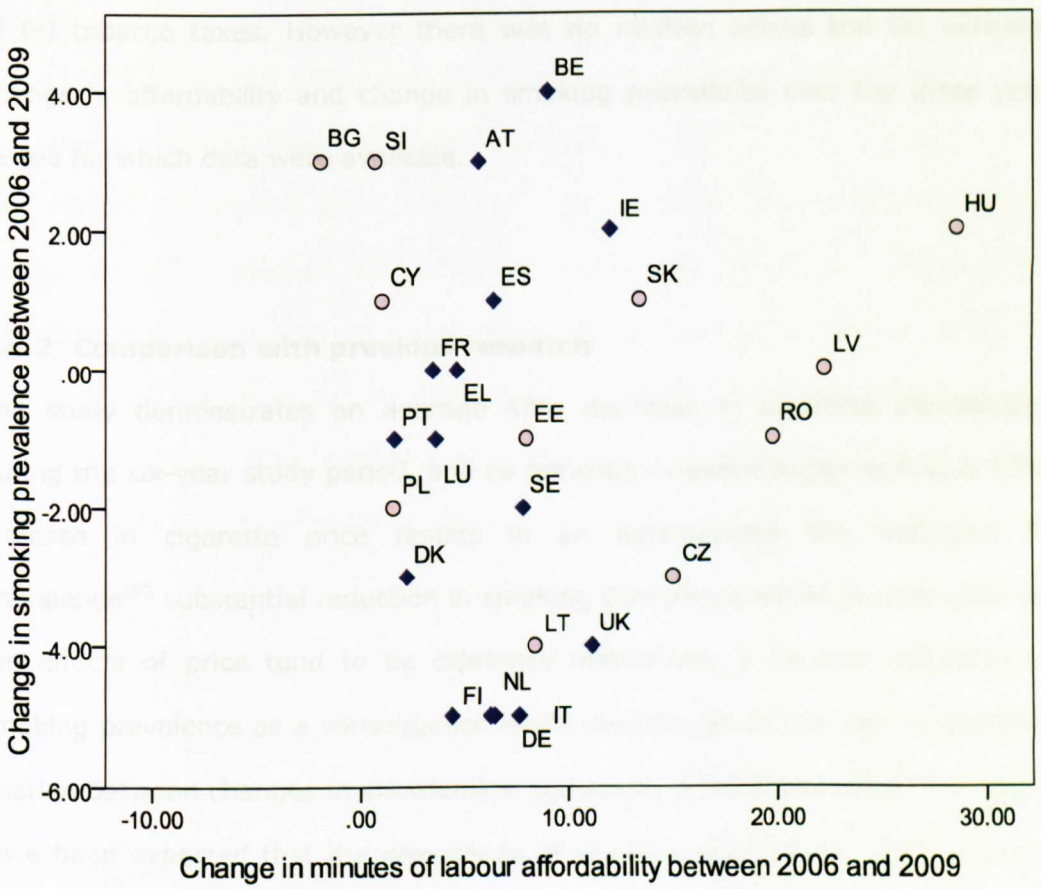

Figure 7.12: Correlation between change in affordability and change in overall smoking prevalence between 2006 and 2009 (circles- new Member States; diamonds- old Member States)

7.4 Discussion

7.4.1 Main findings

This study demonstrates that in 2009 cigarette prices varied six-fold, and affordability four-fold between EU Member States, and also that these measures have changed markedly over recent years. Similarly to findings discussed in the previous chapter, this study suggests that whilst prices have tended to be higher in old EU Member States, higher wages in these countries mean that cigarettes are typically more affordable than in countries that have joined the EU since 2004. In these new Member States affordability has fallen even further since joining the EU, because the effect of increased wages on cigarette affordability has been more than offset by price increases resulting from the implementation of EU tobacco taxes. However there was no relation across the EU between change in affordability and change in smoking prevalence over the three year period for which data were available.

7.4.2 Comparison with previous research

The study demonstrates an average 40% decrease in cigarette affordability during the six-year study period, and as previous evidence suggests that a 10% increase in cigarette price results in an approximate 4% reduction in prevalence[169] substantial reduction in smoking prevalence would be expected. As the effects of price tend to be relatively immediate, a marked reduction in smoking prevalence as a consequence was expected. Given the well established relation between changes in affordability and changes in consumption[171] it might have been expected that the prevalence of smoking would have fallen more in the new than in the old Member States during study period, but this was not the case; in fact, smoking prevalence rose in many of those countries.

However it is possible that this trend reflects the earlier stage of development of the smoking epidemic[19] in those countries, and does not rule out the possibility that the rate of increase in prevalence was reduced by the reduction in affordability described. Alternatively, it is possible that smokers in these countries cut their consumption without quitting, or that the impact of reduced affordability was outweighed by other changes that were not identified in this study. Also, considering the limitations of the Eurobarometer study (described in Chapter 3) it is possible that measurement imprecision can occur in the measurement of change in smoking prevalence, and may have obscured an association between changes in smoking prevalence and cigarette affordability.

High tax benchmarks do not necessarily result in high prices. Similarly to recently published results on the relationship between affordability and tax incidence[408] our findings also show that overall tax incidence and affordability are not correlated. This study also demonstrates that tax is not the only major determinant of tobacco price. In the UK for example, mean cigarette prices increased slightly between 2003 and 2009, yet the tax yield from cigarettes fell, indicating that the tobacco industry also increased its prices during this period. It is recognised that tobacco companies realise a substantially higher profit margin than other comparable consumer companies[409], and may be able to do so because industry price increases appear relatively small while tax levels are high.

In times of economic recession cigarettes tend to become less affordable even if taxes remain at the same level[180]. The study period included is one in which many countries across the EU experienced economic growth, but in 2009 many were experiencing economic recession. The effect of the recession on tobacco consumption is not clear, since on the one hand loss of income through job losses may decrease the affordability of cigarettes, whilst on the other, the stress associated with financial difficulties may inhibit quit attempts[410]. It is also

likely that at times of financial hardship, smokers will switch to less expensive cigarettes, possibly including those supplied through illicit channels. When change in unemployment was used as an indicator of economic recession it was not significantly correlated with changes in cigarette affordability, and did not alter the relationship between changes in affordability and changes in smoking prevalence.

7.4.3 Strengths and limitations

This is the first study to investigate changes in affordability in relation to changes in smoking prevalence in Europe. The main strength of the study is the use of wide range of data which are comparable over time and across the current EU Member States (except Malta).

Initially two measures of cigarette affordability- minutes of labour and RIP- were chosen, but in further analysis minutes of labour measure was selected as the most appropriate measure as confirmed by the results presented in the previous chapter. Also, as stated earlier, the minutes of labour and GDP-based measures produced very similar rankings of EU affordability but the exceptionally high GDP for Luxembourg distorted the range of the GDP-based measure. The minutes of labour affordability method was adopted as the least skewed and most standardised approach, though the absence of data for Malta excluded that country from the affordability comparisons. Also, other limitations with regard to use of UBS survey data as explained in Chapter 6 apply to this study.

The MPPC measure of price was chosen as this is by definition likely to be the most representative of the different prices available of typical cigarette prices paid in each EU country, but the MPPC price does not recognise the availability of cigarettes at much lower prices in all Member States. For this study data at three years intervals were used. Due to the lack of data between selected data points

annual trends in cigarette affordability cannot be observed and important fluctuations in affordability which occur along with economic recession might remain unnoticed.

Analysis of this study is based on ecological associations only and the results of ecological analysis cannot be referred to individual Member States. Although through lack of detailed data and the low statistical power of the ecological analysis it was not possible to adjust for the effect of other tobacco control policy initiatives in individual Member States, none of the EU countries relaxed tobacco control measures during the study period and hence were unlikely to have obscured a true effect of affordability. Also, it was not possible to adjust the relation between changes in smoking prevalence and cigarette affordability for changes in other factors (for example, country characteristics described in Chapter 5) as for many of the variables, data over a longer period of time were not available and thus it would not be possible to estimate changes in these variables. However, attempts were made to adjust for the comprehensiveness of tobacco control policies (measured as Tobacco Control Scale scores), and this did not affect the relationship between changes in smoking prevalence and cigarette affordability. It was not possible to explore any difference in the effect of affordability changes between men and women because the Eurobarometer survey does not provide prevalence data broken down by gender.

7.4.4 Conclusions

The affordability of cigarettes in the old EU Member States is relatively high and decreasing slowly, if at all. Both cigarette affordability and the extent to which affordability is decreasing vary substantially between Member States. The findings imply that price and affordability are not being utilised to their full potential in smoking prevention in all EU Member States, and that the EU could

perhaps redirect its price policy to ensure consistency in affordability across the EU, rather than simply setting minimum taxation requirements that are relatively easily met, especially by old EU countries.

Chapter 8 Conclusions and future directions

8.1 Summary of the results

The overall findings of the thesis show that there is a great variation in adult smoking prevalence between EU Member States, and also between data sources used. These discrepancies in smoking prevalence can partly be explained by methodological differences used to measure smoking across EU countries, differences in current stages of the smoking epidemic and success of tobacco control. Currently measurement of smoking prevalence both at the EU and national level remains inconsistent, unstandardised, and infrequent. Similarly, significant variation was observed in the prevalence of smoking among adolescents. Although significant trends were observed in some EU countries the direction and extent of changes differed between countries and between boys and girls.

Investigation of factors that might contribute to variation in smoking prevalence revealed that corruption, along with a range of well-being and economic development indicators are related to smoking prevalence, but that corruption was the independently significant predictor. Although no evidence was found that corruption influences enactment of tobacco control policy using smoke-free policy as a currently topical tobacco control policy, corruption was related to enforcement of smoke-free policy suggesting that strong and transparent leadership is essential for effective tobacco control policies to be observed.

Having explored different measures of price and affordability, and selected the minutes of labour measure as the most appropriate, it was found that over the time between 2003 and 2009 on average there was a slight decrease in cigarette affordability but again large variation between countries. There was no evidence that these changes in cigarette affordability were related to changes in smoking prevalence.

8.2 Implications

Some national governments are not willing to act effectively to reduce the harm caused by tobacco use. In the ASPECT consortium report, which was prepared for the European Commission and published in 2004, recommendations for the development of tobacco control were included. However, many of these, including those regarding labelling and packaging and tobacco industry surveillance still have not been met. Currently one of the main directives regulating tobacco control is being revised. This offers an excellent opportunity to implement new requirements for tobacco control.

Measuring prevalence reliably and regularly, using standardised and hence comparable measures, is crucial to effective smoking prevention. The lack of well-designed and frequently conducted national surveys in many countries, and the obvious difficulties of standardising national studies, highlight the need to improve the Eurobarometer survey by increasing sample sizes, adopting the most appropriate set of questions, conducting this survey regularly and preferably annually, and improving reporting of the results. Having such data would allow more effective evaluation of implementation of the effective public health policies and comparisons between countries. Methodology from international surveys, for example WHO STEPS surveys, could be used to standardise methods used in national and Europe- wide surveys.

Findings from the thesis also suggest that monitoring of smoking prevalence among young people is currently inadequate for the purpose of investigating changes and trends over time. It is evident that current international surveys which produce data at four year intervals do not provide sufficient information for policy evaluation. At national level, adequate data are only available in a few EU Member States. This again highlights the need for either improved national surveys on smoking prevalence to include younger age groups, or probably more

practically feasible, to enhance the Eurobarometer survey to allow detailed breakdown by age and to include those under age 15.

Findings from the thesis also suggest that the implementation of effective tobacco control policies varies greatly between Member States, and in many cases cannot be considered comprehensive or sufficiently effective. Smoking prevalence in adults typically tends to be higher in Eastern European countries such as Bulgaria, Slovakia and Latvia, that joined the EU recently. For these countries, EU accession might have resulted in faster progress in tobacco control, for example, taxation policy. However, in Greece smoking prevalence remains high despite being an EU Member State for several decades. It is possible that in this country, smoking and a lack of respect for smoking restrictions is more of a cultural issue[411], but the government is clearly not acting effectively to tackle this problem. However, it is difficult to directly investigate cultural influences on smoking and implementation of tobacco control policies.

It is also evident that more attention should be paid to the actual enforcement of tobacco control policies such as smoke-free and advertising restrictions as implementation of policies does not guarantee that they are observed. The results from the studies in this thesis suggest that actual tobacco control policy enforcement is influenced by a range of factors other than policy implementation, including public sector corruption. It appears that corrupt governments are less likely to act effectively to reduce smoking prevalence. However, corruption in this case is not necessarily due to the influence of the tobacco industry through illegal activities such as bribery but may be a marker of susceptibility to influence and persuasion by vested interests. This highlights the importance of strong and transparent governance and the role of the national government in ensuring that tobacco control works effectively in each EU Member State.

Often governments refer to relatively high cigarette prices as a major achievement, however these prices are rarely interpreted in relation to income or changes in income and the disparities in income across the EU are high. Two studies on affordability confirm that in some of the new EU Member States cigarettes are inexpensive in absolute terms of price, but affordability is low because of low income. In some of the old EU countries prices are high but offset by high income. Results confirm that irrespective of the income measure used- national per capita GDP or average hourly wages, ranking of the countries in terms of income was similar. However, results on the Big Mac index for cigarette affordability should be explored further as it is unclear why cigarette prices seems to be so closely related to McDonald's Big Mac hamburger prices.

The thesis also demonstrates that existing tobacco control policies, for example, taxation and cigarette prices which were investigated in more detail are not being used to their full potential. As mentioned earlier, in some countries where reaching minimum taxation requirements has been a prerequisite for joining the EU it has actually resulted in a rapid increase in cigarette prices and thus likely to result in a decrease in smoking prevalence. However, for many of the old EU countries where these requirements have been met for some time, further increases are dependent on the motivation of national government to increase their income through this route, or to pursue price for public health benefit. Meeting EU minimum requirements is not enough and governments should be interested in protecting the health of their citizens by using tobacco control policies to their full potential. Unfortunately, when decisions on tobacco taxation are made, arguments on public health are often overruled by threats that the illicit tobacco market will expand causing important losses to countries' economies.

8.3 Issues identified

One of the main issues regarding the investigation of tobacco control policies across the EU is data availability and quality of data. While in some countries efforts have been made to monitor smoking over time at regular and frequent intervals as a part of wider national health surveys, in other countries data regarding smoking prevalence are scarce and available infrequently thus not allowing the effectiveness of implemented tobacco control policies to be assessed. In many cases it is difficult to locate data and this applies not merely to prevalence data but also data on policy implementation or cigarette price data. In some countries responsibility for collecting and sharing data is split between different institutions making data difficult to obtain. Also, in many cases, all the information is available in the national language only, which again limits use by international researchers.

8.4 Next steps

Although the literature review in the thesis identified six main tobacco control policies it was not feasible to explore all of these in detail in the time available for this thesis. Research gaps on the EU tobacco control policy include, for example, advertising of tobacco products. Although advertising restrictions are similar across the EU Member States as a result of the advertising directive, enforcement and new marketing strategies used by the tobacco industry may differ between countries. Although it was not feasible to investigate them in the thesis I am currently exploring these in further studies. Further EU- wide studies are needed on the effects of implementing pictorial health warnings. Currently it has not been possible to comprehensively evaluate the implementation of pictorial health warnings across the EU as these have been recently implemented only in some EU countries. Also, comparisons of smoking cessation services

provided and information campaigns across the EU were excluded from the thesis for two main reasons. Firstly, smoking cessation services are part of health care systems and the EU does not regulate health care administration at a national level, and service provision also largely depends on health care budget; similarly, information campaigns on quitting smoking are determined by available financial resources and not regulated at the EU level. Secondly, data on smoking cessation services and information campaign spending are scarce and difficult to locate. As the latter two tobacco control policy areas are not likely to be regulated by binding legislation in the nearest future and are national competence, a comparative study across the EU was not conducted. However, it would be necessary to obtain detailed description of these policies implemented at national level, as best practice could be used as a standard approach. Thus the two main tobacco control policies investigated in detail were pricing policy, and smoke-free policy in relation to national characteristics. More descriptive comparisons regarding implementation of smoking restrictions have been published by Smoke-free Partnership[412].

There is an urgent need for detailed smoking prevalence data based on standardised methods and representative, large samples of populations across the EU. This could be achieved either by standardising the methodology used in national surveys, or improving the Eurobarometer survey by increasing Member State population sample sizes and providing more detailed results in the published sources. A standardised approach would include a similar age range of 15 year-olds or older, questions ascertaining daily and occasional smoking of all tobacco products being included, and adequate sample sizes to allow comparisons of smoking prevalence between sexes, age groups and socioeconomic groups. Surveys need to be carried out at reasonable frequency- at least every two years. As for many countries no national data are available,

the Eurobarometer as a source of smoking prevalence should be considerably improved to produce reliable prevalence figures.

Findings from the thesis suggest that efforts should be made to monitor smoking in young people, particularly when policies aimed at young people such as point-of-sale display bans are being implemented. Although advertising and sponsorship is regulated by the EU, after comprehensive restrictions have come into force the tobacco industry is using point-of-sale displays of cigarettes and the pack itself as increasingly important media of communication between the industry and both existing and new customers. New tobacco control policies such as implementation of plain packaging, larger health warnings, and point-of-sale display bans across the EU are the next steps to improve health of the Europeans population and prevent young people across the EU from taking up smoking. Where these policies are being implemented, for example, point-of-sale display bans in the UK, research on the effects of these policies on smoking behaviour is warranted to assess and if appropriate advocate for wide EU implementation.

The EU Recommendation on smoke-free policies emphasizes the importance of evaluating policy effects. Current trends are that in some EU countries, for example the UK or Ireland, large amounts of evidence on the effects of implemented policies exist, is published and available to international public health community. This helps to provide an evidence base necessary for tobacco control policy advocacy worldwide. However, in many EU countries, for example, Latvia, Bulgaria or other new EU Member States, very little evidence exists and tobacco control policy implementation is not monitored and evaluated. Research in tobacco control in these countries therefore should become an important priority for the EU as less wealthy EU Member States cannot afford to or do not invest in research on tobacco control.

One of the studies included in the thesis (presented in Chapter 5) highlighted the importance of factors other than tobacco control in preventing smoking. As measures of perceived public sector corruption used in this study largely refers to business environment, further studies using alternative corruption measurements focused on political corruption are necessary to obtain more evidence on the importance of corruption for success in tobacco control. Also, further studies should be carried out to investigate the association between perceived corruption, smoking prevalence, and tobacco control implementation and enforcement in countries that have not implemented Article 5.3 (on the protection of public health policies with respect to tobacco control from commercial and other vested interests of the tobacco industry) to explore in more detail the specific effects of corruption on tobacco control implementation. Also, more information on the actual enforcement of tobacco control policies would be beneficial for such an investigation, as currently available data mainly from Eurobarometer surveys might not be accurate and reliable due to methodological issues. Furthermore, the Eurobarometer does not include evaluation of enforcement of all tobacco control policies.

8.5 Conclusions

The main conclusion of the thesis is that current tobacco control policies are not used as effectively as they could be, especially policies which are decided on at national level. Some countries like Ireland have made great progress in tobacco control while others are still struggling to implement and enforce tobacco control measures such as a comprehensive smoke free policy. As some national governments are reluctant to implement effective measures, it should be done at the EU level whenever possible.

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